DOCUMENT RESUME

ED 181 255 CE 023 767

TITLE	Agriculture Education. Horticulture.
INSTITUTION	Stuttgart Public Schools, Ark.
SPONS AGENCY	Arkansas State Dept. of Education, Little Rock. Div. of Vocational Education.
NOTE	383p.; Parts of this document may not reproduce well due to small, light type: For related documents see CE 023 758 and CE 023 768-771
EDRS PRICE	MF01/PC16 Plus Postage.
DESCRIPTORS	*Agricultural Education: Curriculum Guides; Employment Opportunities: *Greenhouses; Instructional Materials: Learning Activities: *Ornamental Horticulture: Plant Growth: Plant Identification; *Plant Propagation: *Plant Science; Secondary Education: Teaching Guides: Tests; *Vocational Agriculture

ABSTRACT

This curriculum guide is designed for group instruction of secondary agricultural education students enrolled in one or two semester-long courses in ornamental horticulture. The guide presents units of study in the following areas: (1) horticulture and job opportunities, (2) preparing soil mixtures, (3) control, (4) plant propagation, (5) plant identification, (6) care of ornamental plants, and (7) propagation structures. Each of the eleven units of instruction follows a typical color-coded format: terminal objective, specific objectives, suggested instructor and student activities, instructional materials, information sheet, transparency masters, assignment sheets, and a student test. (LRA)

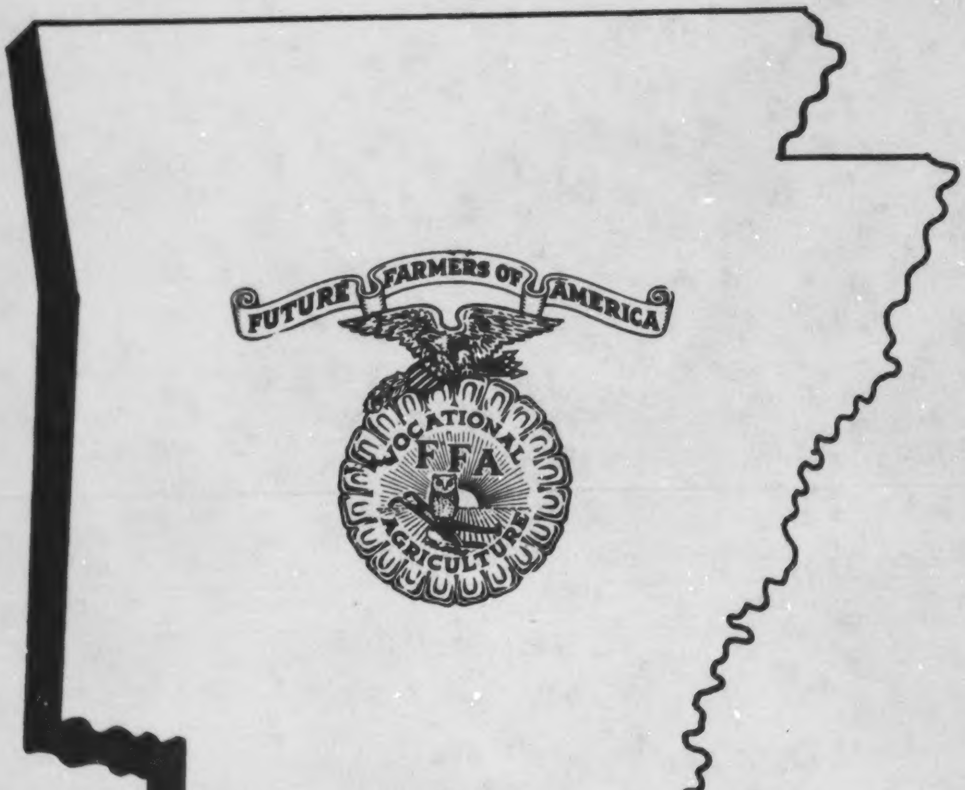
****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

2-13-80

ED181255

AGRICULTURE
EDUCATION

HORTICULTURE



CE 023 767

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Luther Hardin

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PREFACE

This curriculum guide is a suggested method of group instruction for students enrolled in one or two semester-long courses in Agriculture Education.

This material is intended to cover those items which a student will most likely encounter when employed in this given area of agriculture.

Individualized instructional material should be supplemented to this curriculum guide to meet individual and local needs.

This curriculum guide contained herein was performed pursuant to a contract with the Exemplary Section, Division of Vocational, Technical and Adult Education, Arkansas Department of Education.

ACKNOWLEDGEMENT

Appreciation is expressed to the many individuals who gave their time and knowledge to the preparation of this publication. Without the combined efforts of the State Department of Agriculture Education, the Stuttgart Public School System and the teachers of Vocational Agriculture, this publication would not have been possible.

The content of this publication was prepared and reviewed by:

AGRICULTURE EDUCATION STAFF
STUTTGART PUBLIC SCHOOLS

Ned Moseley	Superintendent
J.E. Lawrence	Principal
Joe C. Williams	Principal
John Gentry	Soybean and Rice Production
Glenn Aubrey	Soybean and Rice Production
Vincent Lum	Soybean and Rice Production
Anthony Ashlock	Farm Machinery
Roger Clark	Horticulture
James Rodgers	Horticulture
James Branson	Elements of Farm and Building Layout
Greg Goss	Agriculture Structures
Harlan Peacock	Agriculture Structures
John C. Davis	Agriculture Structures
Richard Gray	Agricultural Metal Working
Wayne Smith	Agricultural Metal Working
James Phillips	Agricultural Metal Working

INSTRUCTORS OF VOCATIONAL AGRICULTURE

Dick Pirkey
Danny Blalock
Billy Watkins
James Gambill
Johnny Neel
Martin Gosset
Dale Thompson
Tom Walker
Lee Griffith
Jack Warnock
Ralph A. Cheshier
Ron Highfill
Wallace Wortham
Jackie Brown
Jack McCord
David Nordin

Garlen T. Willis
Thomas G. Baker
Jim Penn
Troy W. Buck
James Morris
Jimmy Stotts
Thomas Craig
Melvin Daniel
Tommie L. Brown
Jesse F. Bush
Reuben McClelland
Gary Hines
Glen Tice
Terry Waits
David Montgomery
J.R. Buckner

Jerry S. Speir
Howard Easterling
Phillip Rows
James Neely
Harold Ramsey
Emmit Biswell
David Holcombe
Bruce Rylant
William O. McCoy
Tilman Adams
Clyde West
Charles Harvill
Terry Williams
Glynn Gibson
Eddie Plunkett
John Rankin
David Marcantel
James Nicholson
Jerry Davis
Bob Misenheimer

Gary McGhee
Richard L. Penn
Sam Mullins
Marion Spaulding
Patrick Sullivan
Lanny Rice
James Floyd
Ben Lawrence
Danny Allen
William Stark
John Turner
Mickey Sweeney
Jack Watkins
Herman Scott
Gail Thrower
James Boyd
Floyd Gray
Malcolm Patterson
Skip Emmett
Tommie Hill

STATE DEPARTMENT OF EDUCATION VOCATIONAL STAFF

James Dasher
Robert Crawley
Unice Latimer
Bob Verboon
Travis Hopper

Don Harlan
Marion Fletcher
Linda Beene
Peggy Patrick

Other contributors were;

Ciba Geigy Corporation, Greensboro, North Carolina

Alabama State Department of Education, Auburn, Alabama

New Mexico State Department of Education, Santa Fe, New Mexico

State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center, Stillwater, Oklahoma

John Deere and Company, Moline, Illinois

American Association for Vocational Instructional Materials, Room 120, Engineering Center, Athens, Georgia

Hobar Publications, St. Paul, Minnesota

McGraw Hill Book Company, New York, New York

Gratitude is expressed to Jarris Phillips and Rose Mary Jeffery for their help on the illustrations and drawings used in this publication.

Special thanks to JoAnn Newton and Ruth Peacock for their help in printing this publication.

Appreciation goes to Bonnie Branson and Rebecca Grandgeorge for their help in editing this material.

Special thanks to Barbara Hartsell and Brenda Neighbors for composing and typing this publication.

TABLE OF CONTENTS

ORNAMENTAL HORTICULTURE

Section A - Horticulture and Job Opportunities

- Unit I Horticulture and Job Opportunities

Section B - Preparing Soil Mixtures

- Unit I Preparing Soil Mixtures

Section C - Control

- Unit I Insect Control
- Unit II Plant Diseases

Section D - Plant Propagation

- Unit I Cuttings
- Unit II Layerings
  - Sub Unit I Simple Layering
  - Sub Unit II Mound Layering
  - Sub Unit III Trench Layering
  - Sub Unit IV Compound Layering
  - Sub Unit V Tip Layering
  - Sub Unit VI Air Layering
- Unit III Division
- Unit IV Seeds and Thier Growth

Section E - Plant Identification

- Unit I Plant Identification

Section F - Care of Ornamental Plants

- Unit I Care of Ornamental Plants (Water, prune, fertilize)

Section G - Propagation Structures

- Unit I Propagation Structures

SECTION A

UNIT I

HORTICULTURE AND JOB OPPORTUNITIES

HORTICULTURE AND JOB OPPORTUNITIES

TERMINAL OBJECTIVE

Upon completion of this unit the student will be able to describe several job opportunities related to the horticulture field and score at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

Upon completion of this unit the student should be able to:

I. Match terms associated with horticulture to the correct definition.

II. List six areas of work in the horticulture field.

III. Describe the job requirements of the six areas of horticulture jobs.

IV. Describe the job characteristics of the six areas of horticulture jobs.

V. List general requirements for persons to qualify for horticulture jobs.

VI. List ten factors to be considered before choosing an occupation.

VII. List the four steps of job advancement.

VIII. Explain in writing the two factors which determine the speed of advancement.

IX. List 13 jobs in the horticulture field.

HORTICULTURE AND JOB OPPORTUNITIES

SUGGESTED ACTIVITIES

I. Instructor:

- A. Provide students with objective sheet.
- B. Provide student with information and assignment sheets.
- C. Make transparencies.
- D. Discuss terminal and specific objectives.
- E. Discuss information and assignment sheets.
- F. Give test.

II. Students:

- A. Read objectives.
- B. Study information sheet.
- C. Complete each assignment sheet.
- D. Make sure that you are able to perform according to the type of performance called for by each specific objective.
- E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objectives
- B. Information sheets
- C. Transparency masters
    - 1. TM 1 - Occupational Information
- D. Assignment sheets
    - 1. Assignment sheet #1 - Complete Occupational Sheet

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. *Ornamental Horticulture for Vocational Agriculture in Alabama*, 5th printing, 1973.

B. Williams, G.S. *Greenhouse Flowers and Bedding Plants for Agribusiness Studies*, Dannville Illinois, Interstate Printers and Publishers.

C. *Agricultural Cooperative Training for Greenhouse Workers*, College Station, Texas, Education Teaching Material Center.

HORTICULTURE AND JOB OPPORTUNITIES

INFORMATION SHEET

I. Terms and definitions:

  A. HORTICULTURE - The growing of fruit, vegetables, flowers and ornamentals.

  B. FLORICULTURE - The growing and management of ornamental and flowering plants.

  C. POMOLOGY - The science and the practice of fruit growing.

  D. OLERICULTURE - The production, processing and distribution of vegetable crops.

II. Six areas of job opportunities in the horticulture field.

  A. Greenhouse personnel

  B. Nursery personnel

  C. Garden center personnel

  D. Ground maintenance personnel

  E. Golf course personnel

  F. Park personnel

III. Job requirements of the six areas of horticulture jobs.

  A. Greenhouse personnel

    1. Help grow plants in a greenhouse consisting of heated glass, plastic or fiberglass.

    2. May grow vegetables and or flowers.

    3. May propagate trees and shrubs from various means.

    4. Help produce out of season vegetables, pot plants, bedding plants and outdoor plants.

    5. Prepare soils and contains for planting.

INFORMATION SHEET

6. Sow seeds, start cuttings, transplant, water and prune.

7. Act as repairperson for greenhouse structure and equipment.

B. Nursery personnel

1. Help grow seedlings and plants for landscaping, fruit farming and forest replanting.

2. Help prepare seedbeds, seedlings, clear weeds, cultivate, water, prune, spray and graft.

3. Pack plants for shipment.

4. Help with shrubs and trees.

5. Help repair buildings and equipment.

C. Garden center personnel

1. Care for and move plants and supplies.

2. Arrange plants and supplies for displays.

3. Help in selling, cleaning, stocking and arranging supplies.

4. Care for plants.

5. Help customers with the stock and give information about plants.

D. Ground maintenance personnel

1. Care for area surrounding a business-church, industry, etc.

2. Care for lawns and shrubs, mow yards, reseed, spray and plant.

3. May do minor repairs around building.

E. Golf course personnel

1. Care for overall maintenance of golf course.

2. Do some pruning, replace sod, and do general repairs to building and equipment.

INFORMATION SHEET

3. Use irrigation and drainage equipment, clean sand traps, change cup location and aerate the soil.

F. Park personnel

1. Maintain proper maintenance of whole park.

2. Care for flowers, shrubs and lawns in the city parks.

3. Maintain the natural environment in state and national parks.

4. Will care for swimming pools, boat facilities, general maintenance, roads and trash removal.

IV. Job characteristics of the six areas of horticulture jobs.

A. Greenhouse personnel

1. Most work is indoors.

2. Considerable walking, stooping and bending.

3. Light manual labor.

4. Will become soiled from dirt and plant sap.

5. Work regular hours.

6. Overtime during parts of the year.

B. Nursery personnel

1. Considerable outside work as well as inside work.

2. Manual labor.

3. Working hours will be regular.

4. May be able to work all year.

C. Garden center personnel

1. Work in clean and comfortable surroundings.

2. Indoor and outdoor work.

INFORMATION SHEET

3. Work will be fairly regular.
4. May shut down or use skeleton crew in winter months.

D. Ground maintenance personnel

1. Will be outdoors.
2. Seals mostly with ornamental plants.
3. Manual work but not hard.
4. Steady job with regular hours.

E. Golf course personnel

1. Most work is outdoors in good weather.
2. Eight hour work day.
3. Year round work in warm weather regions.

F. Park personnel

1. Most work is outdoors.
2. Some work will be under bad weather conditions.
3. Steady year round job with regular hours.

V. General requirements for persons to qualify for horticulture jobs.

A. Greenhouse personnel

1. Be interested in plants.
2. High school education preferred.
3. Certain physical disabilities won't prevent you from entering the field.

B. Nursery personnel

1. Should enjoy plants and being outdoors.
2. Have good health and no physical handicaps.
3. Be able to drive a truck.

INFORMATION SHEET

4. Have some knowledge and interest of plants.
5. High school education is preferred.

C. Garden center personnel

1. Enjoy working with people.
2. Enjoy caring for plants.
3. Have a high school education.

D. Ground maintenance personnel

1. Be able to work alone.
2. Enjoy working with plants.
3. Should be in good health.

E. Golf course personnel

1. Be in good health
2. Enjoy outdoors.
3. Be able to work with people.
4. Have a high school education.

F. Park personnel

1. Enjoy outdoors.
2. Enjoy working with plants.
3. Have good health.
4. High school education.

VI. Factors to consider before choosing an occupation.

A. What is the nature of work? What kind of jobs will I be expected to do?

B. Does the occupation require chiefly mental or physical effort? Will my health allow me to do this work?

C. Is the work inside or outside or both?

INFORMATION SHEET

D. What are the working conditions? With whom will I be working?

E. What personal qualifications are required for entry into the occupation?

F. What are the educational and training requirements for the job?

G. Is there opportunity for doing a variety of jobs?

H. Will the work require considerable travel and time away from home?

I. What financial earnings can one expect?

J. Are any fringe benefits provided by the business?

K. Is there a great deal of risk involved in performing the job?

L. What security and benefits are offered in the occupation?

M. Are there opportunities for advancement and self betterment?

N. Is the employment on a regular or seasonal basis?

O. Do you work regular hours? Day or night shift?

P. Is there stability of residence?

Q. Will you work alone or with others?

R. How much personal expense is involved in clothing, transportation and meals?

VII. Four steps of job advancement.

A. Laborer

B. Supervisor

C. Assistant manager

D. Manager or owner

VIII. Two factors which determine the speed of advancement.

A. Education

INFORMATION SHEET

B. Experience

IX. Jobs in the horticulture field.

  A. Landscape Architect

  B. Teacher

  C. Landscape Consultant

  D. Floral Designer

  E. Florist

  F. Managers

  G. Sales Supervisor

  H. Salesperson

  I. Tree Surgeons

  J. Landscapers

  K. Groundskeeper

  L. Pest Control Specialist

  M. Plant Disease Specialist

OCCUPATIONAL INFORMATION

JOB	REGULAR INCOME	REGULAR HOURS	OUTDOOR OR INDOOR WORK	VARIETY	WORK WITH OTHERS	STABILITY OF RESIDENCE	FRINGE BENEFITS
Greenhouse Personnel		Generally	Indoor		Yes		
Nursery Personnel	In many cases	Yes, but some peak seasons	Outdoors		Yes		Some
Garden Center Personnel		Yes, but some peak seasons	Both		Yes		Some not much
Golf Course Personnel		During golf season	Outdoors		Yes		Some
Ground Maintenance Personnel		Yes, plus some overtime	Outdoors		Not Necessarily		Some
Park Personnel		Yes	Outdoors		Yes		Some not much

HORTICULTURE AND JOB OPPORTUNITIES

ASSIGNMENT SHEET #1 - COMPLETE OCCUPATIONAL SHEET

Directions - The student will complete the occupational information sheet which will be given out by the instructor.

OH - 17-A

OCCUPATIONAL INFORMATION

JOB	REGULAR INCOME	REGULAR HOURS	OUTDOOR OR INDOOR WORK	VARIETY	WORK WITH OTHERS	STABILITY OF RESIDENCE	FRINGE BENEFITS
Greenhouse Personnel							
Nursery Personnel							
Garden Center Personnel							
Golf Course Personnel							
Ground Maintenance Personnel							
Park Personnel							

HORTICULTURE AND JOB OPPORTUNITIES

ANSWER TO ASSIGNMENT SHEET #1

JOB	REGULAR INCOME	REGULAR HOURS	OUTDOOR OR INDOOR WORK	VARIETY	WORK WITH OTHERS	STABILITY OF RESIDENCE	FRINGE BENEFITS
Greenhouse Personnel	✓	Generally	Indoors	✓	Yes	✓	✓
Nursery Personnel	In many cases	Yes, but some peak seasons	Outdoors	✓	Yes	✓	Some
Garden Center Personnel	✓	Yes, but some peak seasons	Both	✓	Yes	✓	Some, not much
Golf Course Personnel	✓	During golf season	Outdoors	✓	Yes	✓	Some
Ground Maintenance Personnel	✓	Yes, plus some overtime	Outdoors	✓	Not necessarily	✓	Some
Park Personnel	✓	Yes	Outdoors	✓	Yes	✓	Some, not much

HORTICULTURE AND JOB OPPORTUNITIES

TEST

I. Match the terms with the correct definition.

___A. The science and the practice of fruit growing.

___B. The production, processing and distribution of vegetable crops.

___C. The growing and management of ornamental and flowering plants.

___D. The growing of friut, vegetables, flowers and ornamentals

1. Horticulture
2. Floriculture
3. Pomology
4. Olericulture

II. List six areas of work in the horticulture field.

A.

B.

C.

D.

E.

F.

III. Describe the job requirements of six areas of horticulture jobs.

A.

B.

C.

D.

E.

F.

IV. Describe the job characteristics of the six areas of horticulture jobs.

A.

B.

C.

D.

E.

F.

V. List the general requirements for persons to qualify for horticulture jobs.

A.

B.

C.

D.

E.

F.

VI. List ten factors to be considered before choosing an occupation.

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

VII. List the four steps of job advancement.

A.

B.

C.

D.

VIII. What two factors determine the speed of advancement?

A.

B.

IX. List 13 jobs in the horticulture field.

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

M.

HORTICULTURE AND JOB OPPORTUNITIES

ANSWERS TO TEST

I. A. 3

B. 4

C. 2

D. 1

II. A. Greenhouse personnel

B. Nursery personnel

C. Garden center personnel

D. Ground maintenance personnel

E. Park personnel

III. A. To the satisfaction of the instructor.

B. To the satisfaction of the instructor.

C. To the satisfaction of the instructor.

D. To the satisfaction of the instructor.

E. To the satisfaction of the instructor.

F. To the satisfaction of the instructor.

IV. A. To the satisfaction of the instructor.

B. To the satisfaction of the instructor.

C. To the satisfaction of the instructor.

D. To the satisfaction of the instructor.

E. To the satisfaction of the instructor.

F. To the satisfaction of the instructor.

V. A. To the satisfaction of the instructor.

B. To the satisfaction of the instructor.

C. To the satisfaction of the instructor.

D. To the satisfaction of the instructor.

E. To the satisfaction of the instructor.

F. To the satisfaction of the instructor.

VI. Any ten from the following.

A. What is the nature of work? What kind of jobs will I be expected to do?

B. Does the job require chiefly mental or physical effort? Will my health allow me to do this work?

C. Is the work inside or outside or both?

D. What are the working conditions? With whom will be working?

E. What personal qualifications are required for entry into the occupation?

F. What are the educational and trainging requirements for the job?

G. Is there opportunity for doing a variety of jobs?

H. Will the work require considerable travel and time away from home?

I. What financial earnings can one expect?

J. Are any fringe benefits provided by the business?

K. Is there a great deal of risk involved in performing the job?

L. What security and benefits are offered in the occupation?

M. Are there opportunities for advancement and self betterment?

N. Is the employment on a regular or seasonal basis?

O. Do you work regular hours? Day or night shift?

P. Is there stability of residence?

Q. Will you work alone or with others?

R. How much personal expense is involved in clothing, transportation and meals?

VII. A. Laborer
    B. Supervisor
    C. Assistant manager
    D. Manager or owner

VIII. A. Education
    B. Experience

IX. A. Landscape Architect
    B. Teacher
    C. Landscape Consultant
    D. Floral Designer
    E. Florist
    F. Managers
    G. Sales Supervisor
    H. Salesperson
    I. Tree Surgeons
    J. Landscapers
    K. Groundskeeper
    L. Pest Control Specialist
    M. Plant Disease Specialist

SECTION B

UNIT I

PREPARING SOIL MIXTURES

PREPARING SOIL MIXTURES

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to make soil mixtures and know how to keep them germ free. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIE OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with soil mixtures to the correct definition.

II. List nine substances used to make soil mixtures.

III. List seven characteristics of a good plant media.

IV. Know the make up of various types of mixtures.

V. Know how to guard against harmful soil organisms.

PREPARING SOIL MIXTURES

SUGGESTED ACTIVITIES

I. Instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheets.

  C. Make transparencies.

  D. Discuss terminal and specific objectives.

  E. Discuss information and objective sheets.

  F. Give test.

II. Student:

  A. Read objectives.

  B. Study information sheet.

  C. Complete each assignment sheet.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objectives

  B. Information sheets

  C. Transparency masters

    1. TM 1 - Suggested Mixtures for One Cubic Yard of Peat

    2. TM 2 - Recommended Uses and Application Rates for Different Types of Peat

    3. TM 3 - Description of Various Peats

    4. TM 4 - Analysis of Common Horticultural Peats

D. Test

E. Answers to test

II. References:

A. Curriculum Manual, Horticulture I, New Mexico State Department of Education.

B. Hartman, H.T. and Kester,D.E., Plant Propagation, Principals and Practioes, Prentice-Hall, Inc.

PREPARING SOIL MIXTURES

INFORMATION SHEET

I. Terms and definitions:

- A. MEDIA - Several ingredients mixed together that act as intermediary.
- B. AERATION - Exposure to air.
- C. VERMICULITE - A micaceous mineral which can absorb large quantities of water.
- D. PERLITE - A heat treated material, made of lime stone.
- E. PEAT - Substance made of decomposed plant life.

II. Soil mixtures can be produced from:

- A. Soil
- B. Sand
- C. Peat
- D. Sphagnum moss
- E. Vermiculite
- F. Perlite
- G. Leaf Mold
- H. Wood chips-sawdust
- I. Manure

III. Characteristics of a good plant media.

- A. Have enough substance to hold during rooting or germination.
- B. Should remain constant whether wet or dry.
- C. Should have good water holding capacity.
- D. Should permit adequate aeration.
- E. Should be sterile.
- F. Should hold the proper ph range.

INFORMATION SHEET

G. Should contain plant nutrients.

IV. Make up of types of mixtures.

A. From the University of California.

1. 50% Sand
2. 50% Peat Moss

B. From the Horticulture Department of Texas A & M University.

1. 13.5 cu. ft. perlite
2. 13.5 cu. ft. sphagnum
3. 5 pounds super-phosphate (20%)
4. 10 pounds dolomite
5. 5 pounds complete fertilizer (8-12-4)
6. 3 oz. chelated iron

C. From the John Inves Horticulture Institution in England.

1. Potting Compost
    - a. 7 parts loam
    - b. 3 parts peat moss
    - c. 2 parts clean sand
    - d. To each cubic yard add 5 lbs. John Inves Base* and 1 pound ground lime stone.

      *2 parts by weight horn of hoof meal
      2 parts by weight super-phosphate
      1 part by weight potassium sulfate
2. Seed Compost
    - a. 2 parts loam
    - b. 1 part peat moss
    - c. 1 part clean sand

INFORMATION SHEET

- d. Add 2 pounds super-phosphate and 1 pound ground lime stone per cubic yard.

D. For rooted cuttings and ground seedlings.

- 1. 1-2 parts sand
- 2. 1 part loam
- 3. 1 part peat moss

E. For container plants.

- 1. 1 part sand
- 2. 2 parts loam
- 3. 1 part peat moss
- 4. ½ part sawdust

F. Commercial mixture.

- 1. Cornell "Peat Lite" mixes
  - a. Can buy one of several different types
  - b. Need no decontamination
- 2. Jiffy mix
- 3. Pro-mix
- 4. Kys-mix

V. How to guard against soil organisms harmful to plant.

A. Treat soil

- 1. Heat
- 2. Fumigate with chemicals
  - a. Formaldehyde
  - b. Chloropicrin
  - c. Methyl Bromide
  - d. Vapam
- 3. Soil drenches

INFORMATION SHEET

   a. Dexon

   b. Ferrador

   c. Benomyl

B. Use non-infected plants

C. Treat seeds

D. Disinfect flats, benches, soil bins and tools.

Suggested Micronutrient Mixtures for One Cubic Yard of Peat

COMPOUND	WEIGHT REQUIRED
Iron chelate or ferrous sulfate	50 grams (2 oz.)
Manganese sulfate	30 grams (1 oz.)
Copper sulfate	10 grams (0.3 oz.)
Zinc sulfate	6 grams (0.2 oz.)
Sodium borate (borax)	3 grams (0.1 oz.)
Sodium molybdate	1 gram (0.03 oz.)
Total mix	100 grams (3.6 oz.)

Recommended Uses and Application Rates for Different Types of Peat

Peat Use	Normal Application*	Sphagnum Peat Moss	Hypnum Moss Peat	Reed-sedge Peat	Peat Humus (decomposed)
Soil Conditioning	2" layer worked in soil	Fair	Good	Good	Good
Top-dressing lawn	1/8-1/4" layer worked in soil	Fair	Good	Good	Good
Surface mulch	2" layer	Excellent	Fair	Fair	Poor
Potting soil mix	50% peat 50% vermiculite or soil	Excellent	Good	Good	Fair
Golf green soil mix	80% sand 10% clay loam 10% peat	Poor	Good	Good	Excellent
Rooting Cuttings	50% peat 50% vermiculite	Excellent	Good	Fair	Poor
Seed Flat Germination	Pure milled peat	Excellent	Good	Fair	Poor
For acid-loving plants	25% mixture in soil	Excellent	Not recom'd.	Good if below pH 4.8	Not recom'd.
For acid-intolerant plants	in soil 25% mixture	Recom'd. only if limed	Good	Good if above pH 4.8	Good
Shipping tender plants	Wrap roots (wet)	Excellent	Fair	Fair	Poor
Adding stable organic matter	2" layer worked in soil	Poor	Fair	Good	Excellent
Liquid (litter)	2" layer on floor on floor	Excellent	Fair	Fair	Poor
Nitrogen source	Soil mixes top-dressing	Poor	Good	Fair	Good

*by volume

Description of Various Peats

*1. MOSS PEAT – Formed principally from sphagnum, hypnum, and other mosses. Often called peat moss. Least decomposed of the various types of peat. Light tan to brown in color, light weight, porous, high in moisture holding capacity, high in acidity, and low in nitrogen.

2. HYPNUM MOSS PEAT – Darker brown in color, low acidity, formed from swamp plants. The moisture retention and nitrogen content is medium.

3. SPHAGNUM MOSS – Young residue or live portion of the plant called "top moss." It is marketed for tender plants for shipment and for starting root cuttings and seedlings and also for mulching.

*4. REED-SEDGE PEAT – Formed principally from reeds, sedges, marsh grasses, and other swamp plants. Peats of this type found on the market differ considerably in the degree of decomposition and acidity. Fibrous, reddish brown in color, medium nitrogen and moisture-retention capacity.

*5. PEAT HUMUS – Advanced stage of decomposition and in which the original plant remains are not identifiable. Usually derived from reed-sedge or hypnum moss peat. Dark brown to black in color, low moisture-retention capacity, and medium to high nitrogen content. Contains a high amount of lignin material. Most resistant to decomposition.

6. SEDIMENTARY PEATS – Found in the bottom of lakes and in the lower levels of most peat deposits. Derived from algae, plankton, pond weeds. Often contains marl and mineral soil impurities.

7. MUCK SOIL – Highly weathered peat that has been modified greatly by soil microorganism and is usually granular in structure. It has low moisture retention and is seldom recommended for soil improvements.

*Major types

OH - 15-B

Analyses of Common Horticultural Peats

Type	Range in pH	Range of water absorbing capacity* per cent	Range in ash content* per cent	Range in Volume wts. lb./cu. ft.	Range in Nitrogen per cent
Sphagnum moss peat	3.0 – 4.0	1500 – 3000	1.0 – 5.0	4.5 – 7.0	0.6 – 1.4
Hypnum moss peat	5.0 – 7.0	1200 – 1800	4.0 – 10.0	5.0 – 10.0	2.0 – 3.5
Reed-sedge peat (low lime)	4.0 – 5.0	500 – 1200	5.0 – 15.0	10.0 – 15.0	1.5 – 3.0
Reed-sedge peat (high lime)	5.1 – 7.5	400 – 1200	5.0 – 18.0	10.0 – 18.0	2.0 – 3.5
Decomposed peat	5.0 – 7.5	150 – 500	10.0 – 50.0	20.0 – 40.0	2.0 – 3.5

*Oven-dry basis

OH - 17-B

PREPARING SOIL MIXTURES

TEST

I. Match the terms below to the correct definition.

___A. Peat

___B. Media

___C. Aeration

___D. Vermiculite

___E. Perlite

1. Several ingredients mixed together that act as intermediary.
2. Exposure to air.
3. A micaceous mineral which can absorb large quantities of water.
4. A heat treated material, made of lime stone.
5. Substance made of decomposed plant life.

II. List nine substances used to make soil mixtures.

A.

B.

C.

D.

E.

F.

G.

H.

I.

III. List seven characteristics of a good plant media.

A.

B.

C.

D.

E.

F.

G.

IV. List any two types of mixtures.

A.

B.

V. List four ways to guard against harmful soil organisms.

A.

B.

C.

D.

PREPARING SOIL MIXTURES

ANSWERS TO TEST

I. A. 5

B. 1

C. 2

D. 3

E. 4

II. A. Soil

B. Sand

C. Peat

D. Sphagnum Moss

E. Vermiculite

F. Perlite

G. Leaf Mold

H. Wood chips-sawdust

I. Manure

III. A. Have enough substance to hold plant during rooting or germination.

B. Should remain constant whether wet or dry.

C. Should have good water holding capacity.

D. Should permit adequate aeration.

E. Should be sterile.

F. Should hold the proper ph range.

G. Should contain plant nutrients.

IV. Using information from information sheet the instructor evaluates.

V. A. Treat soil

B. Use non-infected plants

C. Treat seeds

D. Disinfect flats, benches, soil bins and tools.

SECTION C

UNIT I

INSECT CONTROL

INSECT CONTROL

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to identify certain insects and know the procedure to use to destroy such insects. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with insects to the correct definition.

II. List three beneficial aspects of insects.

III. List four types of metamorphosis.

IV. Describe no metamorphosis insects.

V. Describe incomplete metamorphosis insects.

VI. Describe Gradual Metamorphosis insects.

VII. Describe complete metamorphosis insects.

VIII. List the life cycle of insects.

IX. Tell how to reduce insect damage through control.

X. Know the names, areas located, characteristics and habits of certain insects.

XI. Know the name, damage caused and control of certain insects.

INSECT CONTROL

SUGGESTED ACTIVITIES

I. Instructor:

  A. Provide students with objective sheet.

  B. Provide students with information and assignment sheets.

  C. Make transparencies.

  D. Discuss terminal and specific objectives.

  E. Discuss information and assignment sheets.

  F. Direct the student through the learning paths for each objective.

  G. Give test.

II. Student:

  A. Read objectives.

  B. Study information sheets.

  C. Complete each assignment sheet.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objectives

  B. Information sheets

  C. Transparency masters

    1. TM 1 - Insect Mouthparts

    2. TM 2 - Different Metamorphoses

    3. TM 3 - The Orders of Insects

D. Assignment sheets

  1. Assignment sheet #1 - Collection of Insects

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Spectracide Home and Garden Insect Control Manual, Greensboro, North Carolina, Ciba Geigy, Corporation.

B. Ornamental Horticulture for Vo. Ag in Alabama.

C. A Curriculum Manual, Horticulture II, New Mexico State Department of Education.

INSECT CONTROL

INFORMATION SHEET

I. Terms and definitions:

- A. PARASITE - An animal which lives off other animals.
- B. MOLT - Shed skin.
- C. METAMORPHOSE - Change in form during development.
- D. INSECTICIDE - Substance that kills insects.
- E. PESTICIDE - Name of chemicals that are toxic to some stage of a plant pest cycle.

II. Three beneficial aspects of insects.

- A. Bees, wasps,and butterflies pollinate flowers.
- B. Products such as honey, wax and silk are produced by insects.
- C. Food supply for fish, birds, etc.

III. Four types of metamorphosis.

- A. No metamorphosis
- B. Incomplete metamorphosis
- C. Gradual metamorhposis
- D. Complete metamorphosis

IV. No metamorphosis insects.

- A. They look like the adult when they hatch except for size.
- B. Example - Aphid

V. Incomplete metamorphosis insects.

- A. Located in the water in the immature stages.
- B. The adults are found flying in the air.
- C. The young insects are called naiads.
- D. Naiads only slightly resemble the adult.

INFORMATION SHEET

   E. They grow for a time then molt, grow, then molt again.

   F. At the last molt they develop wings.

   G. Example - Stoneflies, mayflies.

VI. Gradual metamorphosis insects.

   A. The young resemble adult except for the lack of wings.

   B. The young are called nymphs.

   C. After each molt, the young begin to resemble the adult.

   D. The nymphs and adults have the same food habits.

   E. Example - Aphids, grasshoppers.

VII. Complete metamorphosis insects.

   A. Most common type.

   B. Consist of four stages (egg, larva, pupa, adult)

   C. Larva is quite different from adult.

   D. Larva passes through several stages but does not resemble adult.

   E. When larva reaches maturity it transforms to the pupa.

   F. In the pupa stage it does not eat but drastic changes occur.

   G. In the pupa stage it changes from a worm to the adult body.

   H. Example - Moth, fly, beetle, bee.

VIII. Insect life cycle.

   A. Active season.

   B. Dormant season

IX. How to reduce insect damage through control.

   A. Correctly identify the insect.

INFORMATION SHEET

B. Select the correct insecticide.

C. By the use of predator insects.

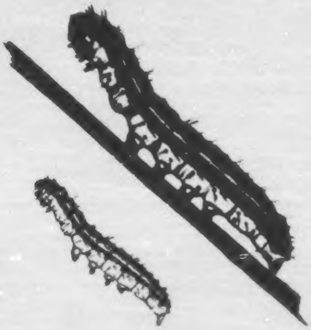
D. Knowledge of the insects life cycle.

X. Identification, areas located, characteristics and habits of certain insects.

A. Lawn insects

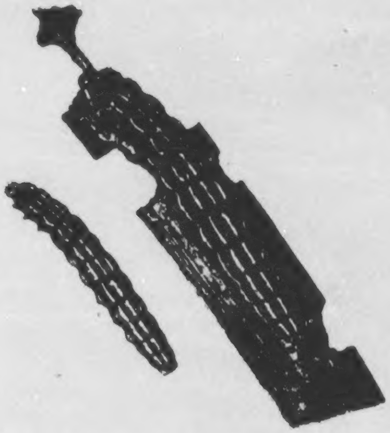
1. Armyworms and cutworms (Noctuidae).In the central states, bare circular areas in lawns may indicate the presence of armyworms. They are light tan to dark green or black caterpillars with white stripes of sides and backs and up to two inches long. Enormous numbers can appear suddenly in the spring or fall, destroying vegetables, corn, grains and other grasses in addition to the flowers of many ornamentals. The southern armyworm is a general feeder in the garden and is fond of climbing plants. The fall armyworm, generally present in the south, migrates èvery year to the northern states.

a. Fall Armyworms (Laphygma Frugiperda). The fall armyworm is essentially a southern insect but is frequently found over most sections of the United States. The young caterpillars just out of the eggs are gray-green to dark brown. Fully grown larvae are about 1½ inches long, pale yellowish brown to black with some white stripes. There is also a characteristic inverted "Y" on the front of the head. Fall armyworms are general feeders, attacking many vegetables and grasses. They are especially fond of boring into the shanks and ears of corn. In lawns armyworms feed on the grass blades and make the turf look ragged and bare.

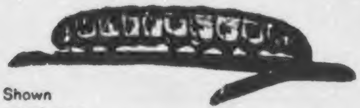


INFORMATION SHEET

b. Southern Armyworms (Prodenia Eridania). Present in many southern states the southern armyworm is a general feeder in the garden. It is especially fond of climbing plants. Full grown larvae are 1 to 1½ inches long and vary in color from dark gray to nearly black, with longitudinal yellow stripes. The young larvae are greenish-gray. When they feed on the leaves of tomatoes and other plants they make a "lace work" pattern, hence the local name of "lace worms" is descriptive. Adult moths have a wing span of about 1½ inches, the front wings being gray with brownish black dots.



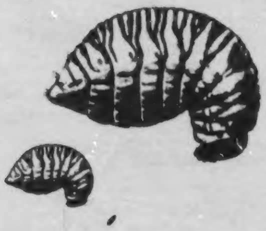
c. Cutworms. Cutworms are soft-bodied, dull gray. brown or black caterpillars. When full grown they vary from 1½ to 2 inches long. Some of the many species are spotted; others have stripes. Most of them have the habit of hiding in the soil or under trash during the day, coming out at night to feed. They frequently cut off plants near the soil surface. Most vegetables, flowers and lawn grasses are subject to attack. Several species climb plants to feed on leaves, buds or fruits. The adults of cutworms are medium-sized, somber-colored moths and at night are readily attracted to lights.



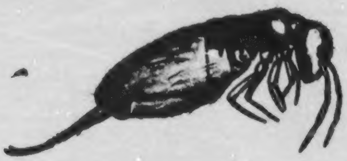
Clay Backed Cutworm

INFORMATION SHEET

2. Billbugs (Grubs) (Calendra maidis). Billbugs of several species are important pests of corn, other grasses, rice, peanuts and sugarcane. The adults, which are called snout beetles, vary in color from light olive yellow to brown and black and are from ¼ to ½ inch long. The larvae or grubs are short, thick-bodied, curved and legless. Injury is caused by the larvae eating the roots and crowns of plants and by the adults feeding on stems and foliage. The characteristic feeding punctures in corn and grasses show up as a series of transverse holes in the leaf.



3. Collembola (Sprintails). These small primitive insects have the unusual habit of jumping like fleas, by means of a tail-like appendage, when disturbed. In the United States there are several variously colored species that range from 1/25 to 1/16 inch long. One widely distributed type is the garden springtail, a dark purplish species that chews small rough holes in leaves and stems of young seedlings. Springtails greatly prefer damp places in gardens and seedbeds.



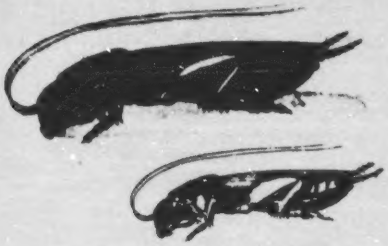
Collembola

4. Crickets and Grasshoppers (Saltatoria)

   a. Crickets (Gryllidae). Although one of our most familiar groups of insects, people generally do not realize that crickets are destructive in gardens. Most species have dark, rounded, grasshopper-like bodies, prominent antennae and are from 3/5 to 1 inch long. Females have a prominent swordlike ovipositor. Crickets hide by day in trash or under boards, coming out at night to feed. They have a varied diet, eating the flowers and tender growth of many garden plants.

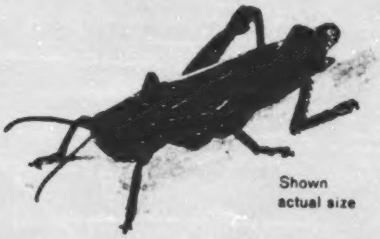
INFORMATION SHEET

One unusual kind called a mole cricket burrows in the ground and uproots grass and plants.



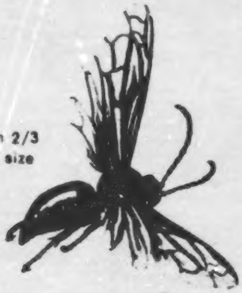
Mole Cricket

b. Grasshoppers (Locustidae). There are many kinds of grasshoppers, most of which feed on any available vegetation and may completely destroy plants. In the garden they are especially destructive during late summer and fall. The young or nymphs resemble the adults but are smaller and do not fly.



Shown actual size

5. Digger Wasps (Sphecidae). Quite a variety of wasps are ascribed to this group. They include thread-waisted forms, cicada-killers, mud daubers, and several mining species as well. Most are predatory, capturing caterpillars, other insects and spiders that serve as food for their young. Frequently they dig nests or burrows in lawns. In the eastern United States one of the most striking digger wasps is the giant, black and yellow, cicada-killer wasp. They appear in late July and August and may damage lawns by digging deep nests or burrows.

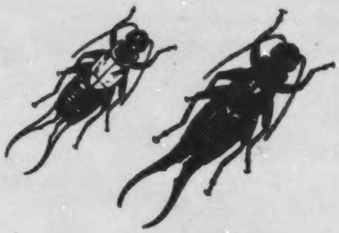


Shown 2/3 actual size

Cicada Killer

INFORMATION SHEET

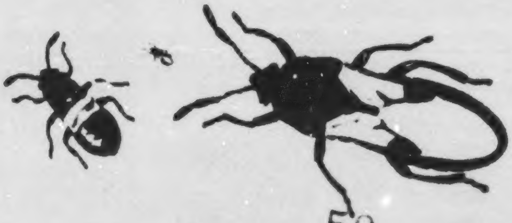
6. Earwigs (Dermaptera). Contrary to superstition, earwigs do not attack human ears but they do attack and destroy vegetables and flowers in the garden. Some types create a nuisance by invading the home. They are easily identified by a prominent pair of forceps at the rear of the body. Earwigs hide in the soil during the day and forage at night. The European earwig is found occasionally in lawns, sometimes breeding in enormous numbers in piles of clippings.



European Earwig

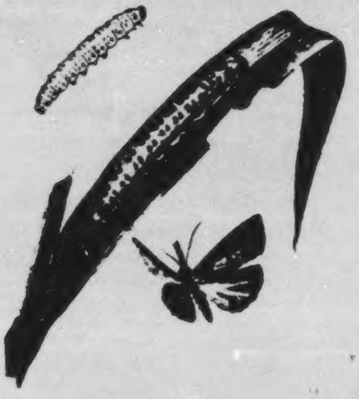
7. Fleas (Siphonaptera). Fleas are narrow-bodied, dark brown, spiny insects with well-developed jumping legs. Their flat shape from side to side permits easy, forward movement through hair. Their food is the blood of man, cats, dogs and many other animals. They may be associated in the spread of the bacterial organisms causing bubonic plague, especially among rodents in the western United States. Fleas also serve as intermediate hosts of the dog and rodent tapeworms that occasionally parasitize man. All irritation to the hosts is caused by the piercing-sucking adult stage. The immature stages develop off the host in organic matter. Fleas occasionally spread to lawns from infested dogs, cats or nearby animal quarters.

8. Lawn Chinch Bugs (Blissus leucopterus insularis). Yellowish spots in the lawn that rapidly turn into brown, dead areas is a symptom of infestation by lawn chinch bugs. This damage is mostly caused by the young bugs or nymphs that suck plant juices from the grass. Full-grown nymphs and adults are reddish-black with white markings and are about 1/6 inch long. Chinch bugs may infest lawns from spring until frost, and even during the winter in southern Florida. One species, called the hairy chinch bug, infests lawns in the East and seems to be on the increase. A similar species attacks St. Augustine grass in Florida.

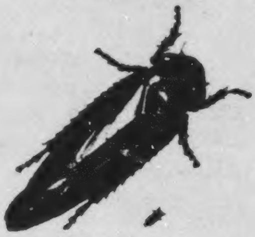


INFORMATION SHEET

9. Lawn Moths (Sod Webworm) (Crambus luteolellus). Feeding mostly at night, the caterpillar or webworms cause irregular brown, dry spots to appear in lawns. You can easily find the worms by breaking apart some of the drying sod. They are about 3/4 inch long, light brown and covered with fine hairs. Usually they are found in silken webs or net that they spin about their bodies. Sod webworms are the larvae of small whitish or gray lawn moths (or millers) that can be seen flying over the grass in the early evening.

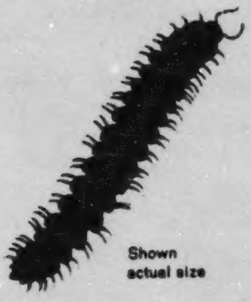


10. Leafhoppers (Macrosteles fascifrons). There are many species of leafhoppers. They are slender, usually green, yellow or brown, and quite small, rarely exceeding ¼ inch in length. The immature forms resemble the adults and can easily be spotted by their peculiar habit of running sideways. All plants in the garden are attacked by leafhoppers. Injury is characterized by white stippling of the leaves, followed by yellowing and eventually browning. They also transmit several important plant diseases.



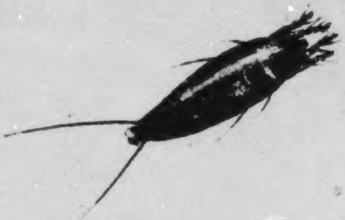
11. Millipedes (Apheloria trimaculata). Sometimes called thousand legged worms, millipedes are brown, strong smelling, elongated creatures. They are uniformly segmented and each segment has two pairs of legs. Most species coil up when disturbed. Millipedes feed on roots, tubers, bulbs, fleshy stems and seeds. They are found mostly under boards, flower pots and other sheltered places, or in compost piles. In Florida the tropical millipede is considered a lawn pest.

INFORMATION SHEET

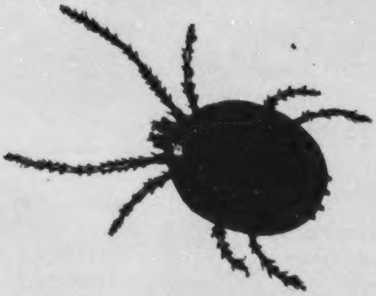


12. Mites and Ticks (Acarina)

a. Bermuda Mites (Aceria neocynodonis). Bermuda mites are so small that they cannot be seen without the aid of some magnification. A relatively new pest, they are now injuring lawns in parts of Florida, Louisiana, Texas, Arizona, New Mexico and California. The mites suck sap from the grass blades, thus causing wilting and stunting. Finally the damage appears as brown spots. When mite damage is severe and the grass is greatly thinned out, weeds usually come in to take the place of the dead grass.

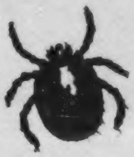


b. Clover Mites (Bryobia praetiosa), An eastern species, this insect was formerly confused with the brown mite of the western states. Clover mites are dark red and about 1/30 inch long. They feed only on herbaceous plants, especially clovers. Frequently they appear in tremendous numbers in heavily fertilized lawns and often invade homes, mostly in spring.



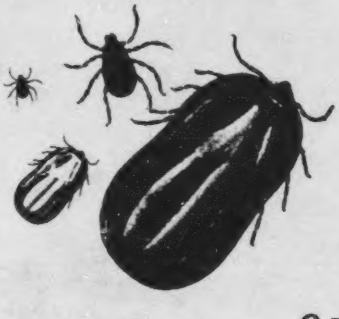
INFORMATION SHEET

c. Chiggers (Trombicula). Chiggers or red bugs are a certain group of mites. They are most numerous east of the Rocky Mountains. During the summer, chiggers invade lawns from surrounding grassy or wooded areas. The microscopic larvae or young mites are extremely annoying to people when they attach themselves to the skin and release a poison that causes severe irritation and intense itching.



d. Ticks. There are several kinds of ticks, most of which attack man. They are usually chestnut brown to blue gray in color, about 1/8 inch long, and have eight long crablike legs. Females and the smaller nymphs become somewhat enlarged when they are engorged with blood. Many of the species inhabit wooded or brushy areas, often migrating to recreational areas or lawns. They may also drop on the grass from infested dogs or rodents. In most section ticks are generally most abundant during the spring.

e. Brown Dog Ticks (Rhipicephalus sanguineus). This is a cosmopolitan tick that closely resembles both the Rocky Mountain wood tick and the American dog tick. Although dogs seem to be the major host, brown dog ticks will attach to other animals and occasionally to man. Nymphs engorged with blood and unfed adults are about 3/16 inch long and engorged adult females are ½ inch long. After engorgement the females drop to the ground, lay their eggs and die. Brown dog ticks frequently invade homes and buildings and become a nuisance. In southern states they are frequently found in recreational areas and lawns.

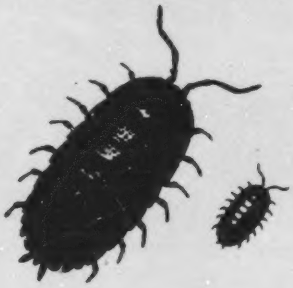


INFORMATION SHEET

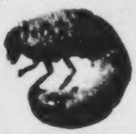
13. Scale Crawlers (Coccidae)

    a. Rhodes Grass Scales (Antonina graminis). Adults are 1/8 inch in diameter, globular, dark purplish brown in color and covered with a white cottony secretion. Nymphs or crawlers move about at first and then settle down to feed. As many as five generations occur in one year. Plant crowns are attacked causing infested grasses to turn brown and die. At present this scale is infesting Bermuda grass and St. Augustine grass in Texas, Louisiana and Florida.

14. Sowbugs (Pillbugs) (Isopoda). These peculiar animals are not insects but belong to a large group that includes crabs and lobsters. They are light to slate gray in color, ½ inch long, and have segmented bodies and seven pairs of legs. Some species roll up and look like pills when disturbed. Sowbugs and pillbugs frequent damp environemnts, feeding on organic matter in the soil and on the roots and tender parts of flowers and vegetables.



15. White Grub of Japanese Beetle, European Chafer and Southern Chafer. The adults emerge in greatest numbers in early summer. Female beetles lay their eggs 2 to 6 inches deep in the soil. Grubs feed mainly on decaying vegetation at first, but later on the roots of grasses and other plants. They frequently cause serious damage to lawns during August, September and October before burrowing down 3 to 12 inches to over-winter.



White Grub

INFORMATION SHEET

B. Tree and Shrub Insects:

1. Aphids. Sometimes called plant lice, aphids are soft-bodies, rounded or pearshaped insects of many colors, seldom over 1/8 inch long. Some aphids appear wooly or powdery because of a waxy excretion. Hardly a plant exists that is not subject to infestation by one or more of the aphid species, each of which may have several generations during the growing season. Aphids, with their tremendous reproductive powers, can increase to fantastic numbers in just a few days. They feed by sucking plant juices, causing a loss of plant vigor, curling or distortion of leaves, and malformation of buds, flowers and fruit. Many aphids transmit virus diseases of flowering plants. Aphids secrete a colorless, sweet substance called "honeydew" that in most species attract ants. This "honeydew" also serves as a medium for the growth of a black, sooty mold.

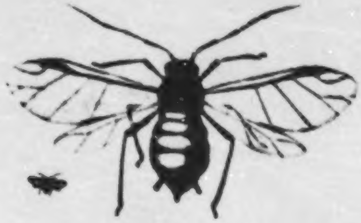
   a. Bean Aphids (Aphis fabae). Tiny, blue-black, sucking insects often found on nasturtium and dock, in addition to beans. Black bean aphids tend to cluster on stems and under leaves. Continuous feeding causes the leaves to turn yellow and the plants to become dwarfed and malformed. Several generations occur throughout the summer.

   b. Black Cherry Aphids (Myzus cerasi). Originally from Europe this aphid has become the most common aphid attacking sweet cherries in the United States. Its shiny black coloration is sufficient for identification, since no similar insect attacks this host. Eggs, which are found near buds, hatch about the time buds break. Nymphs suck sap from new growth, thus causing curling and a distortion of leaves.

   c. Citrus Aphids (Aphis Spiraecola and Toxoptera aurantii). There are at least six important aphid species that attack citrus in North America. The Spiraea aphid, a light green species, is the most important one of citrus in California and Florida. Another species, the black citrus aphid, is also a pest of ornamentals. The feeding of citrus aphids causes conspicuous leaf curling; lower buds, flowers and young fruits may be injured. A sooty-mold fungus develops on the honeydew excreted by these aphids.

INFORMATION SHEET

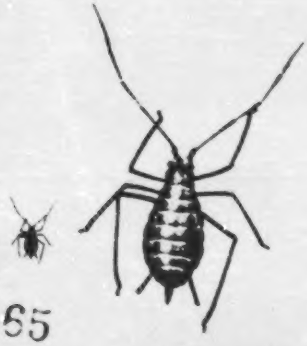
d. Green Apple Aphids (Aphis pomi). Small, yellowish-green, delicate insects that infest the leaves of apple, firethorn, flowering crab and hawthorn. Their feeding causes leaves to curl and stems and twigs to become stunted. During the season new generations occur about every two weeks. The small, dark, oval eggs pass the winter on buds and in cracks in the bark.



e. Leaf Curl Plum Aphids (Anuraphis helichrysi) Pale green to reddish-brown aphids that feed on prune and plum trees during the spring and summer in some of the western states. Infested leaves appear badly curled; growth is stunted and fruit is sometimes misshapen and covered with honeydew.

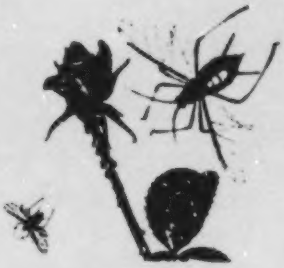
f. Mealy Plum Aphids (Hyalopterus pruni). This aphid, another importation from Europe, is light green but usually appears gray because of a blue-white powdery substance that covers the body. Injury results from removal of plant sap, which causes stunting of growth and smudging of fruits and foliage with honeydew. Mealy plum aphids are especially injurious in California where prunes and apricots are also attacked.

g. Pea Aphids (Macrosiphum pisi). Widely distributed, pea aphids are nearly 3/16 inch long and 1/3 as wide; they are light to deep green in color with reddish eyes. They attack all kinds of peas, alfalfa, clover and related crops. Their feeding causes stunting and wilting of all parts of the plant. This aphid also transmits the casual organism of several virus diseases of alfalfa, peas and related plants.

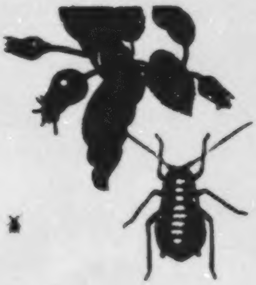


INFORMATION SHEET

h. Rose Aphids (Macrosiphum rosae). Often called Plant Lice, there are five species of aphids that seriously infest roses in the United States. All are soft-bodied, somewhat rounded insects seldom over 1/8 inch long. Some rose aphids have wings and most of them are greenish but early broods may be pink or reddish. They can multiply so rapidly that infested flower buds and stalks quickly become covered with them. They may be present all season long and, as a result of their feeding, tender growth becomes stunted, flowers are disfigured and sometimes the leaves curl and become distorted.



i. Rosy Apple Aphids (Anuraphis rosae). The apple is the favorite host, although the insect also feeds on pear, thorn and Sorbus. The body of these aphids has a waxy coating and usually a slightly purplish or rosy tinge. Both foliage and fruits are injured by the piercing-sucking nymphs and adults. Evidence of their activity is indicated by curled, twisted, stunted leaves, especially tender terminal growth and by stunted malformed clusters of fruits later in the season.

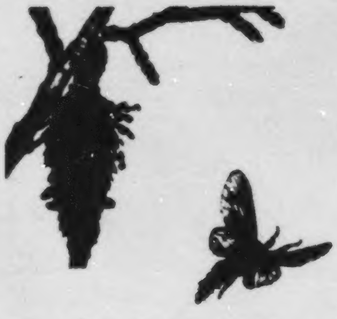


INFORMATION SHEET

j. Spotted Alfalfa Aphids (Therioaphis maculata). The spotted alfalfa aphid is a small, rapidly moving, pale yellow or gray aphid. Four to six conspicuous rows of dark spots with spines are present on the upper abdomen. Recently introduced, it is now found in over 30 states; it is most destructive to alfalfa, bur clover and medic in the southwest. This aphid causes severe wilting and stunting of the crop. Seedlings may be killed outright.

2. Apple and Thorn Skeletonizers (Anthophila pariana). The food of this insect is chiefly the leaves of apple, pear and hawthorn. Of European origin, this species now occurs in the northeastern states from New Jersey to Maine. The full-grown larvae are about ½ inch long with a yellowish-green body and a pale brown head. The moths are dark gray to reddish-brown with a ½ inch wing expanse. By late summer infested foliage may be completely skeletonized; leaves turn brown and then drop to the ground.

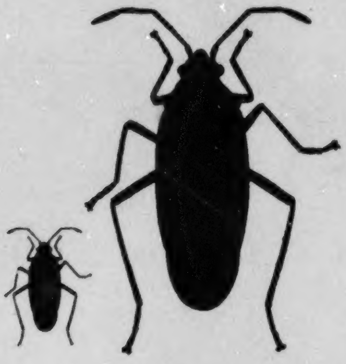
3. Bagworms (Thyrodopteryx ephemeraeformis). Bagworms are soft, brown caterpillars encased in silken cocoon-like bags covered with bits of leaves from the host plant. In most sections of the easten United States bagworms appear in late May or June to feed voraciously on the foliage of evergreens, particularly shrubs and trees. The damage is often overlooked by gardeners until it is too late. Moths of this species emerge in late summer or fall when females lay eggs that overwinter in the bags.



Shown 2/3 actual size

INFORMATION SHEET

4. Boxelder Bugs (Leptocoris trivittatus) These soft-bodied insects, which are strikingly marked in black and red, are about ½ inch long when fully grown. The young bugs or nymphs are bright red with black legs and wing-pads. Boxelder bugs often feed destructively on the flowers, fruits, foliage and the tender twigs of boxelder and a ash trees. They are, however, more important as a nuisance during fall and winter when they swarm into houses or congregate in great numbers on trunks of trees and on porches, walls and walks. They do not feed on anything in or around houses, but because of their numbers, often cause great alarm.

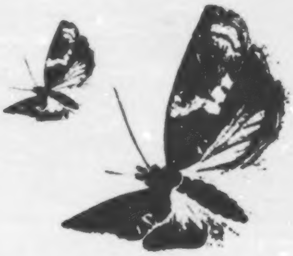


5. European Pine Shoot Moths (Rhyacionia buoliana) This is a very serious pest of red, mugho, Scotch and Austrian pines in the northeastern states. When fully grown the brownish caterpillars are about 5/8 inch long and attack the tip ends of young shoots and buds usually in May or early June. Developing shoots and buds are deformed or killed. The presence of shoot moth larvae is usually indicated by quantities of resin or pitch which hardens over the larval burrows. The rusty orange red moths emerge during June or July. There is only one generation a year.

6. Hemlock Chermes (Chermes tsugae) This sucking insect appears as white cottony encrustations on the bark and as white wooly tufts or patches on the needles of western hemlock. The aphids themselves are hidden beneath the woolly masses. Infested plants appear unattractive and the feeding of the aphids can seriously weaken and kill trees. Ornamental hemlocks, particularly in the Pacific Northwest, are troubled the most.

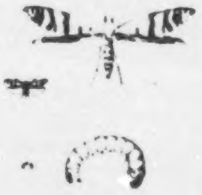
INFORMATION SHEET

7. Holly Bud Moths (Rhopobota naevana). Hollies in the Pacific Northwest are subject to attack by this pest. The moths lay eggs on leaves and twigs during July and August. Winter is spent in the egg stage. The caterpillars hatch from the eggs just after new growth appears in the spring. Injury results from the small caterpillars feeding on the buds and webbing together the new growth.

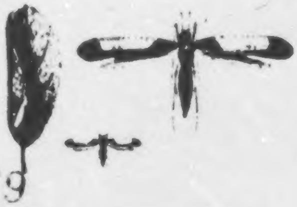


8. Leaf Miners (Diptera, Lepidoptera, Hymenoptera)

    a. Arborvitae Leaf Miners (Argyresthia thuiella) These widely distributed tiny insects excavate small areas between upper and lower leaf surfaces of arborvitae and possibly juniper. Trees appear brown and sickly, and branch tips may die back. When infested leaf tips are held up to the sun, small larvae may be seen inside the translucent mines. The adults are small moths that appear in early summer.

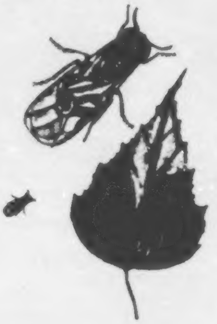


    b. Azalea Leaf Miners (Gracilaris azaleela) This insect is primarily a greenhouse pest but may be carried into the field where it readily becomes established. Larvae of this insect are small yellowish caterpillars less than ½ inch long. They mine leaves and fold over their edges or mine between the two surfaces of leaves, leaving a brown blister. Adults are small yellow moths with purplish markings on the wings.

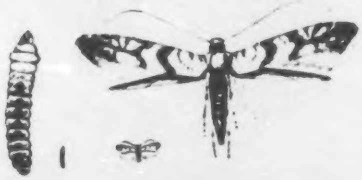


INFORMATION SHEET

c. Birch Leaf Miners (Fenusa pusilla) The tender leaves of gray, canoe and cut-leaf birches are attacked by this insect. Birch leaf miners are small white worms that cause characteristic blotches and blisters on leaves. Infested leaves turn brown in late spring or early summer, The adult is a small black sawfly and prefers to lay eggs on young leaves.



d. Oak Leaf Miners (Cameraria hamadryadella) There are at least two species that cause pale blotches on many kinds of oak leaves. The small flat larvae are the young of small but brilliantly colored moths. The larvae of one species causes blotches on which there is but a single larva per blotch. Another kind makes blotches on leaves of white oak on which 10 or more larvae are found on each blotch. The insect overwinters in the mines of fallen leaves.

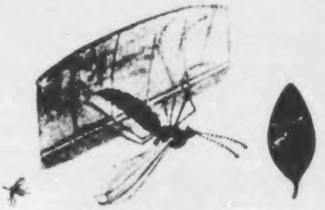


e. Tentiform Leaf Miners (Callisto) At least two species of small moths make mines in the leaves of apples, and occasionally pears and wild cherries. The small, yellow or grayish caterpillars 1/5 to 1/4 inch long, tunnel between the leaf surfaces, causing a crimping that gives the mine a tent-like appearance. Frequently the leaves are distorted and the mines turn brown or spotted.

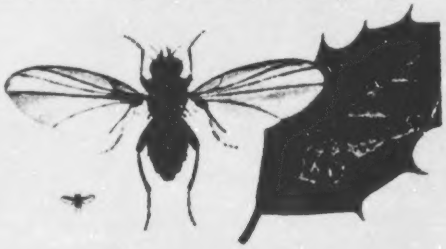
INFORMATION SHEET

f. Dipterous Leaf Miners. This is a large group, all of which are the larvae of small, rather inconspicuous flies. Also known as maggots, they range in color from white to orange and , depending on the species, are from 1/8 to 1/3 inch long. The maggots mine between the upper and lower leaf surfaces of many kinds of plants, causing characteristic white serpentine or blotched areas to appear. In the United Atates, the plants most often attacked by dipterous leaf miners include holly, boxwood, chrysanthemum, columbine, spinach, beets, peas, beans, tomatoes and corn.

g. Boxwood Leaf Miners (Monarthropalpus buxi) The boxwood leaf miner is a very small fly, the larvae or maggots of which mine and feed inside the leaves of boxwood. Irregular oval swellings appear on both sides of the leaves. In the fall, infested leaves turn yellow, then brown. The orange maggots spend the entire summer inside infested leaves.

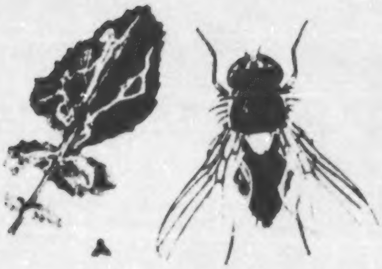


h. Holly Leaf Miners (Phytomyza ilicis) Small, light-colored maggots that mine leaves, causing irregular yellow-to-brown patches. Each patch or mine is winding and narrow but increases in width as the maggot develops. Foliage on badly infested trees appears unhealthy and somewhat faded. The adults are tiny black flies and appear about the time new leaves develop in the spring.

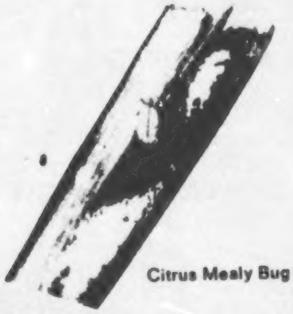


i. Serpentine Leaf Miners (Liriomyza brassicae) The feeding of this small, yellow maggot causes the production of slender, white winding trails through the leaves of cabbage, kale and other crucifers. The foliage of tomatoes and numerous ornamentals is also affected. They are common throughout the United States. Several generations occur during a summer.

INFORMATION SHEET

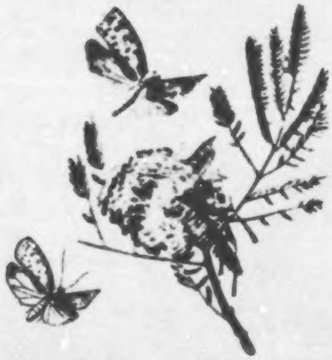


9. **Mealy Bugs** (Pseudococcidae) Mealy bugs attack a wide variety of plants including apricots, apples, citrus fruits, grapes and many ornamentals. There are several species and most do not get over ¼ inch long. They derive their name from the fact that their oval or elongated bodies are covered with a white, waxy, or mealy excretion. Infested plants are stunted and unthrifty. Copious amounts of honeydew are produced, on which a black sooty fungus grows. Mealy bugs are often attended by ants.



Citrus Mealy Bug

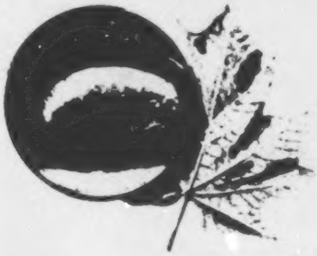
10. **Mimosa Webworms** (Homadaula albizziae) Mimosa webworms are small, gray striped caterpillars that web together the foliage of mimosa, or Albozzia, and also honey locust. Infested leaves are grayish in color and appear very unsightly. In most sections of their range two generations a year are produced, with webworms being present from May until frost.



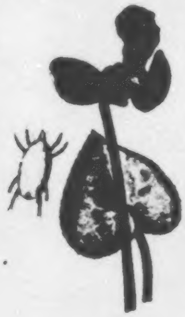
INFORMATION SHEET

11. Mites

a. **Blister Mites** (Eriophyidae) This is a fairly large group of minute microscopic mites with elongated bodies and but two pairs of legs at the anterior end. They attack a wide variety of plants, especially fruit trees. The feeding of one common species, the pear-leaf blister mite, causes galls and red-to-black blisters on the leaves of pear, apple and mountain ash. Buds and fruit are also attacked.

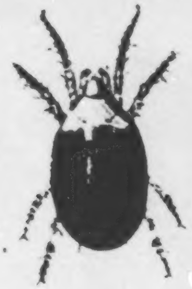


b. **Cyclamen Mites** (Steneotarsonemus pallidus) Too small to be seen without magnification, the adults are amber or caramel-colored, about 1/100 inch long, and slow moving. The young are even smaller and are milky white. The mite is chiefly a greenhouse pest of cyclamen, African violets and snapdragon. At times, however, it seriously injures garden plants such as delphinium, dahlia and strawberry. Symptoms of their presence, caused by the removal of plant sap, are distortion and stunting of flowers and foliage, with or without blackening of the areas fed upon. Attacks are confined primarily to the younger leaves.

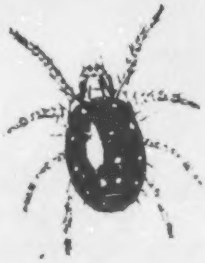


INFORMATION SHEET

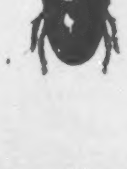
c. Spider Mites (Tetranychidae) Often called "red spiders", spider mites are tiny eight-legged creatures that attack a wide variety of plants and are particularly troublesome during warm, dry weather. Among the plants frequently attacked are various fruit trees, beans, roses, spruces and tomatoes. They appear as tiny moving specks on the underside of leaves and may form fine silken webs. Infested foliage appears bronzed or rusty.



d. European Red Mites (Panonychus ulmi) Introduced from Europe prior to 1911, this spider mite has become one of the most important pests of apples, elms, peaches, pears and plums. The mites are usually rusty in color but newly emerged females are bright velvety red. Infested foliage is pallid and sickly or bronzed and from a distance has the appearance of being covered with dust. Fruit is undersized and of poor quality.

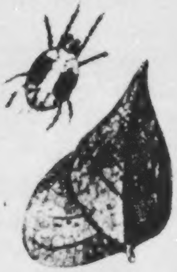


e. Privet Mites (Brevipalpus abovatus) At least 3 species of very small mites are known to infest privet. They cannot be seen with the naked eye but occur in great numbers on the undersides of leaves where they suck plant juices. Infested leaves show a gradual yellowing or fading. Severe infestations may cause the foliage to drop.



INFORMATION SHEET

f. Two-Spotted Spider Mites (Tetranychus bimaculatus) This widely distributed species is probably the most troublesome of all the spider mites. It feeds on many hosts, being especially fond of garden vegetables, flowers and ornamentals. All active stages remove plant sap, usually from the under-surface of the leaves, resulting in tiny light spots. If these areas are magnified, variable colored mites with two darker pigmented spots , as well as small pale green spherical eggs and fine webbing, will be seen.



12. Oak Loopers (Lambdina fiscelleria somniaria) Full-grown loopers are about 1¼ inches long and range from yellowish-green to brown, with diamond-shaped markings on the back. The caterpillars drop and remain suspended on silken threads when disturbed. This species shows a distinct preference for Oregon white oak on which it feeds in Oregon and northward into British Columbia. Other trees may be attacked, but usually only when intermingled with the preferred host tree. Complete defoliation may result if infestations are not checked.

13. Oblique-Banded Leaf Rollers (Archips rosaceanus) This widely distributed leaf roller may be found attacking apple foliage in the spring and fruit as well as foliage in the summer. Rose, aster, carnation, geranium and many others are also fed upon. The young pale-green caterpillars have black heads and are up to 3/4 inch long. They mine the leaves first, then feed inside rolled leaves tied with silk. The adult moths are brown, with three oblique darker bends on the front wings, and a wingspread of nearly 1 inch.

14. Obscure Root Weevils (Sciopithes obscurus) The adults are small, grayish-brown weevils, about ¼ inch long, with a dark white bordered, irregular line marking off the dorsum. In the far-western states these adults are injurious to the opening buds and new foliage of fruit trees. The larvae or young are small, white C-shaped grubs that live and tunnel in the roots of strawberry and possible other plants.

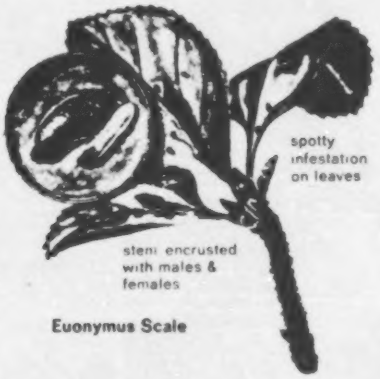
INFORMATION SHEET

15. Omnicerous Leaf Tiers (Cnephasia longana) In the western states the caterpillars are serious pests of strawberry, flax, vetch, aster, chrysanthemum and a wide range of other field and garden plants. They are about 5/8 inch long when fully grown and have brownish-yellow or mottled brown heads. The body appears longitudinally striped due to darker brown colored areas. In the early stages of growth the larvae mine the leaves, later tying them together.

16. Pear Slugs (Caliroa cerasi) Of European origin, this chewing insect is fond of skeletonizing the leaves of pear, cherry, plum, quince and apple in most sections of the United States. Newly hatched larvae are greenish-black, semitransparent, slim and slug-like. Later they change to typical sawfly larvae nearly ½ inch long, swollen at the front end and shaped something like a tadpole. The adults are glossy black, four winged sawflies about the size of a house fly. Sawflies are closely related to bees and wasps.

17. Scale Crawlers

    a. Cottony Cushion Scales (Icerya purchasi) In the southern part of the United States this soft scale insect weakens and stunts a wide variety of shrubs and trees including citrus and many ornamentals. The crawlers of young are small, red, flattened creatures which begin to feed soon after hatching and become covered with waxy cottony filaments and powder. During the growing season there is an almost continuous hatching of young. Mature females are large, about ¼ inch long, red-brown and covered with yellow waxy filaments. Easily spotted are the large, white cottony egg masses about ½ inch long.


spotty infestation on leaves
stem encrusted with males & females

Euonymus Scale

INFORMATION SHEET

b. Lecanium Scales (Lecanium) This common scale insect attacks numerous fruit and shade trees and ornamental plants. The crawlers or newly hatched young are pale-yellow, flattened insects barely visible to the naked eye. They appear in early summer and migrate to leaves to suck sap. The adults are dark brown, 1/8 inch long, convex and look much like shiny raised "pimples" on the twigs and branches. Large quantities of honeydew are produced by the scales which cover foliage, stems or fruit and serve as a medium for the growth of a sooty fungus.

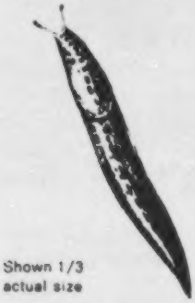
c. Pine Needle Scales (Phenacaspis pinifoliae) These are small, white, elongated scales that infest the needles of various pine species and varieties. Heavily infested pines have the appearance of being hit by frost. By sucking plant juices this insect causes the foliage of infested trees to become weakened, pale and sickly in appearance. There are usually two generations a year, with crawlers or nymphs being present during May and again in July.

d. San Jose (Aspidiotus perniciosus) Most cultivated fruits and a large number of ornamental plants throughout the United States are hosts of this insect. Osage orange is often heavily infested and serves as a reservoir for reinfestation. The small newly born lemon-yellow crawlers or nymphs resemble mites. After crawling from under the edges of the stationary female scales, they migrate over plant parts before inserting their mouth parts into bark, leaves or fruit to feed. On heavily infested twigs and branches the entire surface is covered with a thin gray layer of overlapping ashlike scales.

e. Soft Scales (Coccus hesperidum) Also known as brown soft scale. Female scales are oval, rather flat and nearly 1/8 inch long. Citrus, gardenias, hollies and camellias are among the many plants affected. Scales encrust twigs and leaves, giving a lumpy appearance. Infested plants are weakened and stunted. This insect also produces large amounts of honeydew that drops to the leaves below. A sooty mold develops on the honeydew that smuts the foliage and mars the beauty of plants.

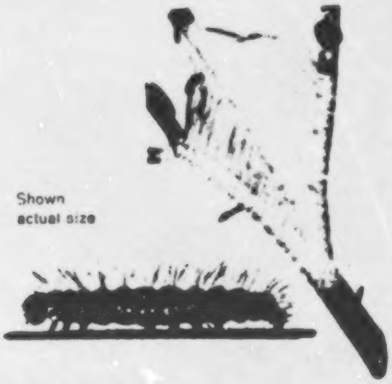
INFORMATION SHEET

18. Slugs (Limax maximus) Slugs are soft, slimy creatures black, gray or brown, often spotted or mottled with black, and range in size from ½ to over 4 inches in length. They look like snails without shells and leave a telltale, glistening slimy trail wherever they have crawled. Slugs are injurious to many garden flowers and vegetables, especially in damp and shady areas. They feed on the foliage mainly at night and hide under objects during the day. Their feeding is very irregular and the foliage may be badly shredded.



Shown 1/3 actual size

19. Tent Caterpillars (Malacosoma americanum) Several species of tent caterpillars construct unsightly tents or nests in forks and crotches of apple, hawthorn, oak, flowering crab and many other deciduous shrubs and trees. The various species are native to this continent with outbreaks being recorded in Massachusetts as early as 1646. The hairy, usually strikingly colored, caterpillars are up to 2 inches long, and appear early in the season. They crawl out of their tents to feed on leaves, and in late spring wander in search of more food or a place to sping their cocoons.



Shown actual size

INFORMATION SHEET

20. Webworms (Dichomeris marginella) These are small reddish-brown caterpillars that web together the needles and tips of various junipers. They feed on the surface of needles, causing foliage in webbed portions to turn brown and die. Heavy infestations are very unsightly. The insects spend winter as partly grown larvae within the webbed needles and complete their growth and feeding the following spring. The female moth with a wingspread of 3/5 of an inch emerges in late spring to lay eggs on foliage.

    a. Cotoneaster Worms (Cremona cotoneaster) Cotoneaster shrubs that have their leaves skeletonized and covered with unsightly webs are probably infested with this insect. Small shrubs may be killed outright; others are greatly held back.The larvae or caterpillars are yellowish at first, but later turn brown and make silken tubes. The adults are night-flying, grayish-black moths and emerge to lay eggs in the spring.

    b. Fall Webworms (Hyphantria cunea) This caterpillar is a general feeder on deciduous trees and shrubs throughout most of the United States. Infestations are often seen during mid-to-late summer on roadside trees and in neglected orchards. Besides defoliation the larvae produce large unsightly webs, usually on the tips of branches. Fall webworms are hairy, light tan caterpillars about 1 inch long with black and orange spots over the body. The adult moths are pure white with a 1¼ inch wing expanse.

21. Whiteflies (Aleyrodidae) The adults are small wedge-shaped white insects that fly like snowflakes when disturbed. The young are pale green, rounded, flat and scale-like and stay motionless on the underside of leaves. Infested leaves become pale, mottled or stippled and the plants may eventually turn yellow and die. Leaves can also become sticky with honeydew and often are coated with a black, sooty mold. There are several species distributed throughout the United States that attack a wide range of hosts including citrus, greenhouse plants, vegetables and ornamentals.

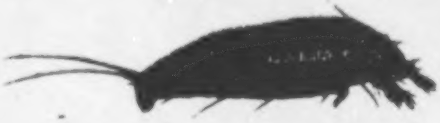
INFORMATION SHEET

C. Rose and Flower Insects:

1. Flea Beetles(Halticinae) A variety of plants in the garden are attacked by flea beetles. They are small beetles 1/16 to 1/8 inch long; black, brown, metallic blue or striped. Enlarged hind legs enable them to jump like fleas when disturbed. The tiny white larvae feed on roots and are seldom seen. Young plants, especially transplants, are severely damaged. Leaves look as though they had been shot full of holes.

2. Mites

   a. Carnation Bud Mites (Aceria paradianthi) Called also a grass mite, this species is important since it spreads a carnation bud rot. The affected buds rot before the flower opens. White varieties are especially susceptible. The glistening, translucent, egg-like bodies of the female mites may be found inside the diseased buds with the aid of a magnifying glass.

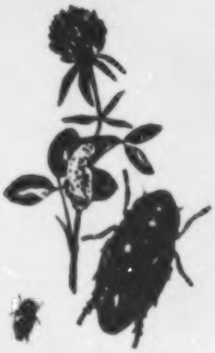


   b. Carnation Shoot Mites (Aceria) This mite is a relatively new pest of carnations. Like many plant feeding mites, the carnation shoot mite is extremely small and cannot be seen without the aid of a magnifying glass. Their general shape is long and slender and they vary in color from white to light red. The mites live down in the growing shoots and are usually well protected by the leaves. Symptoms of infestation are stunted plants and imperfect flowers.

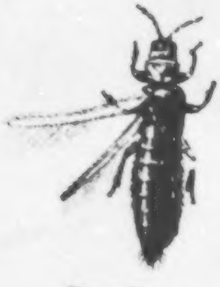
3. Plant Bug Nymphs (Miridae) These are the young non-flying stage of several species of medium-sized insects generally called plant bugs. They have piercing-sucking mouth parts and attack many garden flowers and vegetable crops. Damage is primarily to buds and developing seeds. Effects produced include distorted growing tips and buds, flower fall, and various reactions attributed to the salivary juices injected into the plant.

INFORMATION SHEET

4. Spittlebugs (Philaenus leucophthalmus) There are several species of spittlebugs that attack alfalfa, clover, strawberries and several ornamentals including chrysanthemums and roses. They are present over much of the United States, but cause the most damage in the northern states. The nymphs or young spittlebugs are pinkish to yellowish-green and up to 3/16 inch long. In the spring they are usually found in or under masses of white froth or spittle that they produce. These nymphs suck plant juices, which causes stunting of plants. The somber-colored leafhopper-like adults cause no damage.



5. Thrips (Thysanoptera) Thrips of many species are pests on a varitey of plants but are most serious on vegetables and ornamentals. Among the favored hosts are asparagus, beans, onions, iris, gladioli and roses. They are slender, usually brownish or yellow, insects varying in size from less than 1/25 to 1/8 inch in length. Infested leaves have stippled appearance similar to that resulting from mite infestations. It is not difficult to distinguish between mite and thrips infestations, since thrips leave small brownish specks of excrement wherever they feed. Flower buds that are infested either fail to open or are deformed, streaked and discolored when they open.



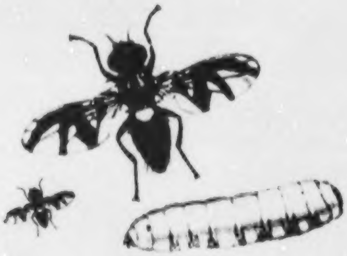
Flower Thrip

INFORMATION SHEET

D. Fruit Pests:

1. Woolly Apple Aphids (Eriosoma lanigerum) These aphids are recognized by the white woolly covering at the posterior end of their blue-black bodies. They are found all over the world. Besides apple, they attack elm, mountain ash and hawthorn. They feed on plant sap from the roots as well as from the upper parts of the trees.

2. Apple Maggots (Rhagolelis pomonella) Early varieties of apples in the colder section of the United States are often injured by these maggots of medium-sized black, white and yellow flies. This pest is also known as the "railroad-worm" because of the brown winding galleries running through part of the flesh. Heavily infested fruits will be reduced to a rotten mass filled with yellowish legless maggots. Other plants affected are crab apples, blueberries, huckleberries, plums and cherries.

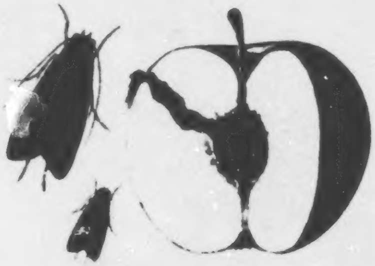


3. Apricot Mealy Bugs (Pseudococcus) Only in recent years have mealy bugs become a pest of apricots (especially in California). The principal damage is the accumulation of honeydew, secreted by the insects, on the fruit. A black fungus that grows in this substance gives the fruit an unsightly appearance. The insects themselves are about ¼ inch long, dark purple and covered with a uniformly distributed white powdery wax. They are commonly found beneath bark scales and at the base of shoots.

4. Cherry Fruit Flies (Rhagoletis cingulata) Cherries infested with cherry fruit flies appear misshapen and undersized and they ripen prematurely. Inside are yellowish-white footless maggots, up to ¼ inch long and pointed at the head. Broken burrows extend through the fruit. These pests attack sweet and sour cherries, pear, plum, and a number of wild cherries.

INFORMATION SHEET

5. Codling Moths (Carpocapsa pomonella) If left unchecked this notorious pest will infest from 20 to 95 percent of the apples in any orchard. Apples attacked have holes eaten into the side, or from the blossom end, to the core. The seeds and core are tunneled and eaten by pinkish-white, brown-headed worms about 3/4 inch long when full grown. In most section there are at least two generations. Pear, quince, and crabapples may also be attacked.

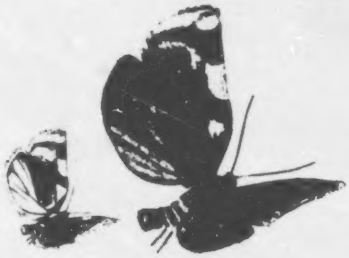


6. Cranberry Fruitworms (Acroeasis vaccinii) This is one of the pests most feared by cranberry and bluebrrry growers wherever these crops are grown. It belongs to a family of small moths, the larvae of which feed, for the most part, on the internal portions of fruits. Cranberry fruitworms are small, pale in color and cylindrical. The damage is from larvae entering the fruits during the summer.

7. Eye-Spotted Bud Moths (Spilonota ocellana) Although widely distributed, this inscet is most important in the northern apple-growing sections. Pear, cherry and wild plum also serve as hosts. In the spring when the leaves unfold, the small brown caterpillars, which have black heads, attack the buds and leaves. They may be found feeding inside buds or in rolled or twisted leaves webbed together with silk. In early summer the adult moths deposit eggs for the next generation, which appears from mid-June to mid-July.

INFORMATION SHEET

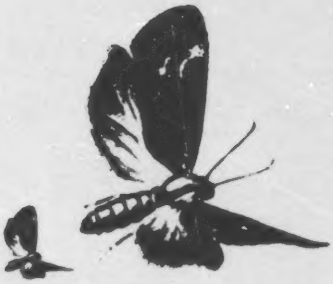
8. Fruit Tree Leaf Rollers (Archips argyrospilus) This native leaf roller occurs in the northern half of the United States from coast to coast and in Canada. Although considered mostly as an apple pest, it injures all orchard fruits and some forest trees. The larvae of the moths are slender, pale-green caterpillars up to 3/4 inch long with heads and a black spot just behind the head. Early larval feeding on blossom buds may prevent setting of fruits. Serious damage results where the leaves are held against the fruits with silk, the larvae feeding within.



9. Grape Beetles (Coleoptera) Several species of beetles attack the buds and leaves of grapes wherever they are grown. Those beetles that injure grapes in the East differ from those in the western states. Throughout the Mississippi Valley and eastward the grape flea beetle, a metallic, blue-green, 1/5 inch long, frequently eats grape buds and skeletonizes leaves. A related, steel blue species is a pest in California. Other beetle pests of grapes in the East are the rose chafer and the highly destructive Japanese beetle. The grape bud beetle, a light-to-dark gray species, is an important grape pest in the San Joaquin Valley of California.

10. Grape Berry Moths (Paralobesia viteana) This is the only common insect that does extensive damage to grape berries. It is especially destructive in the large grape-growing areas east of the Mississippi and north of the Ohio River. The larvae of grape berry moths are green or gray-green, slightly hairy, and about ½ inch long. There are usually two generations a year, the larvae of the first feeding on blossoms and webbing together small clusters of fruit. Caterpillars of the second generation eat their way into the berries and feed on the pulp and seeds.

INFORMATION SHEET



11. Grape Leaf Folders (Desmia funeralis) Widely distributed from coast to coast, the grape leaf folder is the larva of a dark brown moth spotted with white. Full grown caterpillars are 3/4 inch long, light green with faint dark markings. They feed on the tissue inside folded portions of the leaves and rarely become numerous in sprayed vineyards. There are two generations each season with perhaps a third in the South.

12. Mites

    a. Brown or Almond Mites (Bryobia arborea) Also known in California as the almond mite, this is one of the largest of the plant feeding mites. About the size of a pinhead, they are dark, rusty brown or olive green with amber or orange legs. The long front legs are usually extended in front. They feed on apples, peaches, prunes, plums, pears, cherries, almonds, walnuts and raspberries. The chief damage is from the mites extracting chlorophyl from the leaves, causing them to turn yellow.

    b. Cherry Rust Mites. These very small, elongated mites are about 1/100 of an inch long. They feed on open-leaf surfaces and are sometimes called leaf vagrants. The mites suck sap from leaves, causing them to turn rust colored. Severe infestations may cause curling and stunting of foliage and some leaf drop.

INFORMATION SHEET

c. Pacific Spider Mites (Tetranychus pacificus) This western species is closely related to the two-spotted spider mite. They are about 1/60 inch long. The adult females are greenish with large lateral dark spots. When abundant, this species causes leaves to become bronzed and heavily webbed with fine silk. All fruit and several ornamentals are attacked.

13. Peach Twig Borers (Anarsia lineatella) This boring caterpillar is of considerable importance in unsprayed or neglected orchards. Peaches, plums, apricots and almonds are attacked. The chocolate-brown caterpillars 1/8 to 1/16 inch long, start their activity about the time peach leaves appear in the spring. They work their way inside the twigs and new growth, as well as into the fruits. As the twigs die, black, small masses of gum exude from them.

14. Pear Psyllas (Psylla pyricola) The adults are dark, reddish-brown, cicada-like insects about 1/10 inch long. The nymphs or young are much smaller, yellow in color, and very active. Although present in the East since 1832 it has only recently become a pest of pears in the western states. The leaves on heavily infested pear trees turn brown and often drop. Honeydew excreted by the insects drops on the leaves and fruit, and a sooty black fungus develops on it.

15. Pecan Nut Case-Bearers (Acrobasis caryae) This moth is one of the most important pecan pests throughout the Pecan Belt. Most of the damage is done by first generation larvae that become active about the time nuts are setting, frequently boring into recently set nuts. The characteristic masses of frass, which are held together by silken threads, protect the larvae and also hold the nuts together. Full-grown larvae are about ½ inch long; they have olive-gray to jade-green bodies and yellowish-brown heads.

16. Scales

a. Forbes Scales (Aspidiotus forbesi) This is an armored scales, so called because the insects live beneath a hard, gray, scale-like shell. These gray, thin,flaky scales may be found massed on the trunk and branches of cherries, apples, apricots, pears, plums, quinces and currants. Examination with a microscope will show a raised reddish area in the center of each scale, which distinguishes it from the similar San Jose scale. There are up to three generations a year.

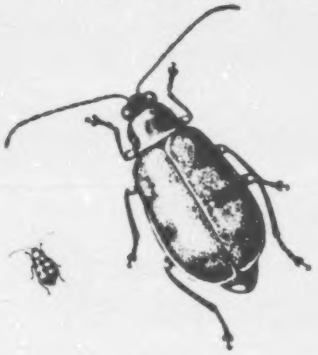
INFORMATION SHEET

b. Olive Scales (Parlatoria oleae) This armored scale insect, an important pest of olives in California, will develop on over 200 hosts plants, including many ornamentals. The female scales are oval, dirty gray and are about the size of a pinhead. Infestation of olives may cause the fruits to be discolored and severely deformed, making them worthless for pickling purposes.

E. Vegetable Insects:

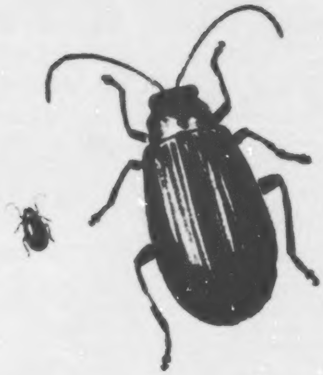
1. Yellow Clover Aphids (Therioaphis trifolii) This yellowish species is confined primarily to red and ladino clovers in the northeastern, midwestern and southern states. Damaged hosts appear stunted and slightly off-color. Large amounts of honeydew may also be produced.

2. Cucumber Beetles (Banded) (Diabrotica balteata) This beetle, adult stage of the rootworms has a distinctly southern distribution. The adults are attractive beetles about ¼ inch long, greenish, with three distinct dark bands across the wing covers. The seldom-seen larvae feed on the roots of corn, potatoes, cucurbits and other plants. The adults are generally feeders in the field and garden and have been observed damaging corn.

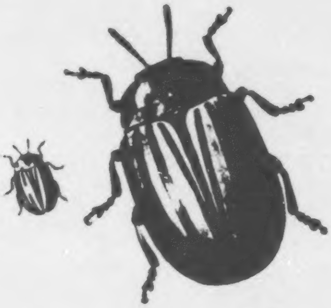


3. Cucumber Beetles (Striped) (Acalymma vittata) Greenish-yellow beetles of several species, 1/5 to 1/4 inch long with black spots or stripes. These adults feed on the foliage and flowers of cucumbers, squash, pumpkins and other cucurbits, as well as over a score of ornamentals. They are especially fond of attacking seedlings as they push through the ground. In addition the beetles transmit the organisms that cause bacterial wilt and mosiac. Infection of these organisms is often more damaging than the insects. The larvae, known as rootworms, feed and tunnel in the roots of corn, potatoes and other plants.

INFORMATION SHEET

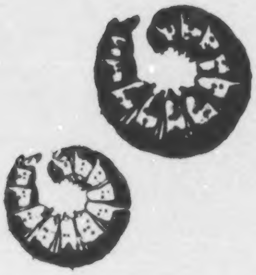


4. Colorado Potato Beetles (Leptinotarsa decimlineata) One of the most destructive insect pests of potatoes, tomatoes and eggplants is the well-known Colorado potato beetle. The adults are yellow with black stripes, 3/8 inch long. The larvae or young are brick red, humpbacked and about 3/5 inch long. In early spring the conspicuous orange eggs are laid on favorite host plants. These eggs hatch and the larvae, along with the adults, seriously defoliate plants. They are especially injurious to small garden plantings.



5. Black Cutworms (Agrotis ipsilon) This species attacks many vegetable and field crops. Vegetable crops grown in rows or hills are particularly susceptible, frequently being cut off near ground level. The larvae are soft-bodied, stout, greasy gray to dark brown or black in color, and are about 1¼ inches long when full grown. They are most active at night, spending days curled up in the soil or under clumps of sod or debris. They overwinter in the larval or pupal stage in the soil. The large adult moths are black and brown, and are frequently attracted to lights.

INFORMATION SHEET



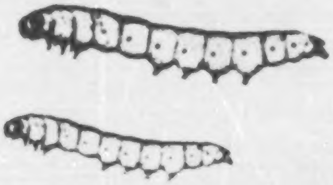
6. Diamondback Moths (Plutella maculipennis) If you find a caterpillar on cabbage, broccoli and related plants, that wriggles violently when disturbed it is probably the diamondback moth caterpillar. It also has a habit of dropping from the host plant and hanging by a silken thread that it produces. The light-green, slender larvae, up to 1/3 inch long, eat small holes in leaves and buds. The small inconspicuous moths are harmless.

7. Drosophila (Vinegar Flies) Who hasn't seen these annoying small flies hovering over the fruit bowl? There are several species and they are often extremely numerous and pestiferous, especially during the fruit and tomato canning season. Also known as pomace flies, they are attracted to and breed in well-ripened or fermenting fruit products.

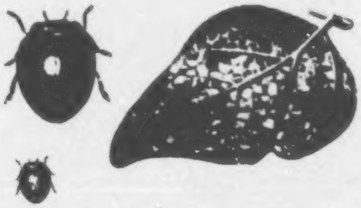
8. Harlequin Cabbage Bugs (Murgantia histrionica) Both the adults and nymphs are shield-shaped bugs up to 3/8 inch long. They are black and usually brilliantly marked with red or yellow. Harlequin bugs are found from California to Virginia but are most abundant in southern sections. The adults spend the winter near old cabbage temnants, emerging in the spring to infest various crops. The bugs suck sap from plants, which results in severe wilting. Although primarily a pest of cabbage, broccoli and related plants, they will also attack flowering plants such as chrysanthemum, rose, sun flower and flowering kale.

9. Imported Cabbage Worms (Pieris rapae) Ragged holes in the leaves of cabbage, broccoli and related plants usually indicates the presence of the imported cabbage worm. The larvae or caterpillars are velvety green and when fully grown are about 1¼ inches long. They feed on the undersides of leaves and bore into heads, rendering them unfit for consumption. From three to six overlapping generations are produced during the season. The adults are the

familiar white butterflies that are common in all sections of the country.



10. Mexican Bean Beetles (Epilachna varivestis) This insect is actually closely related to the lady beetles but there the similarity ends. Native to the semiarid southwestern states, it is now found infesting snap and lima beans in most sections of the United States. Home gardeners are especially hard hit. The copper colored, oval adults have 16 black spots on thier backs and are about ¼ inch long. Larvae are orange to yellow, 1/3 inch long and usually fuzzy or spiny. During the spring and summer, adults and larvae feed on and usually skeletonzie pods and leaves.



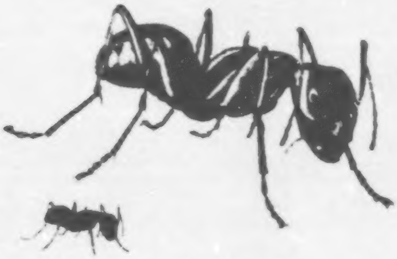
11. Onion Thrips (Thrips tabaci) Adult thrips that are not over 1/16 inch long are dark bodied slender insects. The nymphs or larvae are smaller and very pale. Found everywhere, onions and many vegetables and ornamental plants are affected. Damage is caused by the insects sucking plant sap with their rasping-sucking mouthparts, causing tiny, white stippling to appear on the leaves. These thrips also transmit spotted wilt virus disease to tomatoes, dahlias and many other ornamentals.

INFORMATION SHEET

12. Sap Beetles (Nitidulidae) There are many species that are usually dark in color and 1/8 to 1/4 inch long. The adults are attracted to ripening or fermenting fruits or vegetables. Several species attack sweet corn, the white, maggot-like larvae (1/4 inch long) doing most of the damage by eating into the kernels.

F. Nuisance Pests:

1. Ants (Formicidae) Most people identify ants by means of their characteristic small necks and waists. There are many troublesome kinds, ranging from the little black ant to large species over ½ inch long. Ants build nests in lawns by forming hills or mounds around nest openings, frequently smothering the surrounding grass. They may also prevent good stands by destroying grass seeds. A few ant species attack flowers and shrubs and some such as fire and harvester ants, bite people.

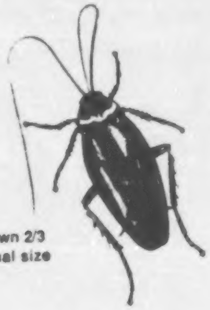


Black Carpenter Ant

2. Cockroaches (Blattidae) These insects that are shiny and flat bodied are well known to almost everyone. Cockraoches have been on earth for millions of years. They have filthy habits, feed on many knnds of material, and are active mostly at night. There are about six species that are particularly troublesome in the United States. Some species are erroneously called water bugs, although they do frequent damp places.

INFORMATION SHEET

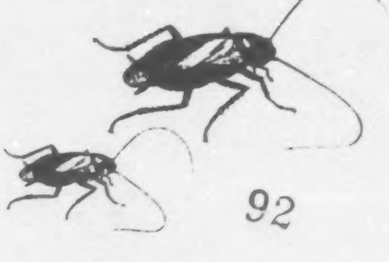
a. American Cockroaches (Periplaneta americana) Adult american cockroaches are large insects about 1½ to 2 inches long, mahogany brown in color with wings that cover the abdomen. The nymphs or young resemble the adults but are smaller. The total life span of this cockroach may be as much as 2½ years. This species is most common in basements, restaurants, bakeries and grocery stores.It is also found infesting garbage dumps during the summer months.



Shown 2/3
actual size

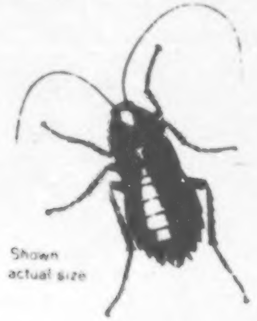
b. Brown-Banded Cockroaches (Supella supellectilium) This cockroach has only recently spread over many of the Gulf Coast and northern states. It is also known as the "tropical cockroach". Both sexes have indistinct light-brown bands across the wings. The female is mottled brown. The male is light brown and is more slender that the female. The young are smaller and wingless. This cockroach develops and is troublesome all over the house, infesting furniture, television sets, curtains, backs of pictures, etc. Egg capsules or "pods" are placed in cracks and crevices, inside cabinets and in other out-of-the way places.

c. German Cockroaches (Blattella germanica) This species is also called "croton bug" and "water bug". Nevertheless, it is a cockroach and it is the one most frequently found in kitchens and bathrooms. It is by far the most common of all the household infesting species. The adults are light brown, about 1/2 to 5/8 inch long, with two black stripes on the thorax. The female lays her eggs in a bean-like capsule, which she drops a day or so before the eggs hatch; about 30 cockroaches hatch from a capsule.

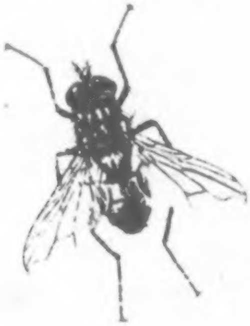


INFORMATION SHEET

d. Oriental Cockroaches (Blatta orientalis) Aliases of this repulsive creature are "black beetle" and "shad roach". Females are dark brown to almost black in color. They measure from 1 to 1¼ inches in length and have very short wing stubs or pads. The males are slightly smaller and possess wings that nearly cover the abdomen. Oriental cockroaches are considerably more sluggish that other kinds and are considered the filthiest of all cockroaches. They develop in damp basements and sewers, foraging mostly on the first floors of buildings.



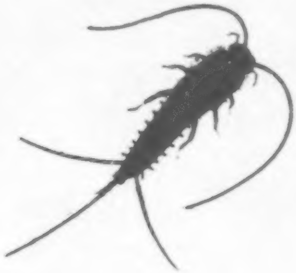
3. Flies. Even though they don't bite, house flies are one of the most annoying insects around the home and farm. They are not only a nuisance, but because of their filthy habits are also suspected of transmitting disease organisms to food. House flies breed in animal excreta, lawn clippings, garbage and similar materials. Another group of flies that annoy almost everyone are the blow flies. These familiar flies, usually metallic in color, infest decayed meat, fish, animal carcasses, excreta, etc. All flies go through four stages, egg, maggot or larva, pupa (resting stage) and adult.



House Fly

INFORMATION SHEET

4. Silverfish. These insects are small, carrot-shaped, and wingless. When full grown, they range in size from 1/3 to 1/2 inch in length, varying with the species. Their bodies are covered with scales giving them a shiny appearance. Reproduction is by means of eggs, with the young similar in appearance to adults, except in size. They feed on a variety of materials, including bindings of books, wallpaper, or any papers on which paste has been used. Silverfish prefer dampness, and are often found in basements and other areas of the home. When exposed to light, they will be seen scurrying for cover.



INFORMATION SHEET

XI. Description, damage caused and control of certain insects.

A. Chewing Insects:

1. Ants - Although plant damage from ants is seldom serious, they often eat seeds and small seedlings. Since they carry aphids and mealy bugs from one plant to another, it is desirable to kill them. Chlorodane is the most effective control.

2. Blister Beetles - This insect varies in color from black to gray and some are striped. They are about four times as long as wide, not overly active, but can quickly ruin the foliage or flowers. They are quite troublesome on asters and mums. Blister usually appear on the fingers if the insects are crushed in the hand. DDT or parathion is effective on them.

3. Black Vine Weevel - The adult is about 3/8 to 1/2 inch long and lives overwinter in trash or dead leaves. The larvae also overwinters in the soil. In the spring adults enter the greenhouse and lay eggs on the soil. These hatch into grubs which feed on roots or underground portions of plants. Azaleas, camellias and cyclamen are the most common florist plants attacked. Sterilization of the soil, DDT, dieldrin, or lindane added to the soil will kill them.

4. Corn Borer - The pink or flesh-colored larvae of this pest is often troublesome on geraniums and mums. Almost mature larvae overwinter in corn stubble. In the spring they pupate and emerge in June. The females lay eggs at night on underside of foliage. Larvae bore into the stem and cause it to wilt if the tunnel is sufficiently large to injure the vascular system. The stem may be so weakened that it breaks off. The invaded stem should be destroyed and plants protected in June by dusting with DDT. Dust at 5-day intervals until late August.

INFORMATION SHEET

5. Corn Ear Worm - In late summer and fall, the larvae of this pest may do considereable damage to flowers of standard mums. Eggs are laid on buds. The young larvae are only 1/16 inch long, but they develop rapidly as they feed and are commonly 1 to 2 inches long when the damage is first noted. Large feeding larvae are brown to green in color with indistinct markings of brown, black or green. Occasionally, they attack carnations, gladiolus, and geraniums. DDT is most effective on them.

6. Cutworms - These are the larvae of some night-flying moths. The larvae are usually plump and shining about 1 to 2 inches long at maturity, depending upon the type. They cut off the stems of plants underground, and the climbing kinds eat the foliage or flowers. They hide in the soil during the day and damage the plant at night. Soil sterilization will kill them. They may be hand picked if few in number. Chlorodane, dieldrin and DDT on plants is quite useful. A 10% DDT dust on the soil will kill cutworms that crawl through it if the material is supplied liberally.

7. Earthworm - Though not insects, they can be serious pests. They digest soil in thier paths, and upon leaving thier bodies it is pubbled. When numerous, they honeycomb the soil and may injure roots. Soil sterilization will control them; otherwise chlorodane, DDT applications should be made periodically. Mercury compounds may do more harm than good and should never be used in rose greenhouses.

8. Fuller's Rose Weevil - Adults of this pest are grayish with an oblique whitish line of the wing cover. Females lay eggs on branch tips. The grubs fall to the ground and chew on roots. They are most destructive to azaleas, roses and gardenias. Lindane on soil will control the larvae. Foliage dusts of lindane, DDT and dieldron will destroy adults before they lay eggs.

9. Grasshoppers - The eggs of grasshoppers overwinter in soil where they hatch into young nymphs which lack fully developed wings. Their damage to foliage and flowers is well known, they can strip a plant of leaves a short time if present in great numbers. Mums are the most seriously affected. Chlorodane and dieldrin are the best materials for their control.

10. Leaf Cutting Bees - These honeybee like insects cut almost perfectly circular areas from rose leaflets. They seldom become serious and can be controlled with parathion.

INFORMATION SHEET

11. Leaf Minors - Adults of leaf minors are small winged insects which lay eggs on leaves. Larvae bore into leaves and make irregular shaped tunnels or blotches between the upper and lower epidermis which are light yellowish tan to brown in color. Mums and asters are often affected. Azalea leaf minor may cause the leaf to twist or appear as if pinched between thumb and forefinger. These larvae mature and they fold the leaf together with threads and feed on the inner surface. Snaps are often damaged by this pest. In late stages control is difficult, but when the larvae are tunneling in the leaf, parathion, lindane or malathion sprays penetrate the tissue and kill them.

12. Leaf Rollers and Leaf Tiers - This group of pests can be very destructive. The adults are moths which lay eggs on foliage. Eggs hatch in 5 to 12 days and larvae feed on foliage, leaving only the upper epidermis between the veins, giving the area a parchment like appearance. Later the larvae tie one or more leaves together and pupate. Mums, roses, carnations and asters are often damaged by these pests. DDT, parathion, malathion is effective when applied before the larvae have rolled up the foliage.

13. Millipedes - These are brownish-colored, wormlike animals which have two pairs of legs on each body segment and are not true insects. They live in soil and feed on dead organism matter or live roots. Lindane soil drenches or DDT are effective controls.

14. Orchid Weevil - The adult as small, black and shiny and feeds on the flowers and young leaves while the larvae or grubs eat into the new roots, causing them to die. DDT or lindane is effective against them.

15. Roaches - Several kinds of roaches may be found in greenhouses and the Surinam Beetle, or roach is common. They eat seedlings and cuttings and may chew at the bark at the soil line on such woodly plants as roses. DDT, chlorodane, and parathion dusts or sprays are effective controls.

16. Rose Midge - The adult is a fly about 1/16 to 1/20 inch long, reddish to yellow-brown in color. The yellow eggs are laid in the buds behind the sepals or in the unfolding leaves of the young shoots. These hatch in 2 days and the yellow-orange maggots feed for about a week. They distort the flowers and chew the buds in the axils of the young leaves. They drop to the ground and pupate, emerging in about a week to mate and repeat the cycle.

INFORMATION SHEET

DDT is applied to the plants, to soil in and under the benches, and to the walks in the greenhouse three times at 10 to 12 day intervals will effectively control them. Heavily infested buds and shoots should be pinched and destroyed. Parathion is also effective.

17. Rose Stem Sawfly - The larvae of wasplike insects are occasionally troublesome on roses. Eggs laid in the stem hatch, and the larvae bore into the shoots, causing them to wilt. Destruction of the cane is the best cure.

18. Slugs and Snails - These animals are related to clams and oysters, and their bodies are soft and slime covered. Snails have a hard shell, but slugs are fully exposed. They vary in length, depending upon the type, and may be ½ to 4 inches long. They emerge at night and feed on the leaves and petals. A sticky secretion is given off from the body and when it dries, there is a shiny trial where they have crawled. During the day they may be found under pots, bench litter, and other places where it is damp and dark.

    Seedlings are often damaged, and many of the softer-foliaged plants are subject to damage. Poisoned baits using metaldehyde as an attractant and chlorodane as the poison are very effective. Old metaldehyde loses its effect, and only fresh material should be used.

19. Sow bugs and Pill Bugs - These pests are not insects but are related to shrimp and crayfish and breathe through gills. They are found only in very damp or moist places. They are light gray or slate colored, about ½ inch long, elliptical in shape. Their backs are covered with plates, they have seven pairs of legs. The young develop from eggs in a pouch on the female, where they remain for 2 months. They eat dead organic matter but also attack the roots and stems of seedlings and cuttings. Very often the Rhizoctonia fungus develops after injury from these pests and the plant dies from rot. About a year is required for matuirty. The pill bug rolls into a ball when disturbed; hence the name. DDT, chlorodane or parathion on the soil is effective in controlling them.

20. Springtail - These insects feed on decaying organic matter and are found in great numbers in most greenhouses. In rare instances they may damage small seedlings. They are less than 1/10 inch long and are usually white, cream, or tan in color. They are wingless and cannot fly, but they have a forked muscular appendage at the end of the abdomen and this enables them to jump for surprising distances. They are objectionable but not

necessarily harmful. DDT, lindane, chlorodane, parathion will control them.

21. Strawberry Root Worm - This can become a serious pest on roses. The adults are about 1/8 inch long, brown to brownish black and the females lay eggs on the bench litter. These hatch in 10 to 14 days and the grubs feed on rose roots, causing a check in growth. They become fully grown in 35 to 60 days and then pupate in the soil for about 2 weeks. They emerge as adults, which feed on the foliage, causing numerous small shot holes. DDT is effective, when applied as recommended for rose midge.

22. Symphylids or Garden Centipedes - These pests shun dry soil or sunlight and hence are not often seen. They chew the roots of a wide range of plants, the growth of the plant is stunted, and very few new white roots will be found.

    The young symphylids hatch in about 2 weeks from eggs laid in the soil, They have 10 body segments, 6 pairs of legs, very short antennae, or "feelers." They shed their skins and grow to maturity. The mature are 1/4 to 3/8 inch long, possess 14 body segments, 12 pairs of short legs, and antennae about 1/3 as long as the body. If clods of soil are broken apart, any symphylids present will quickly dart back into the moist, dark confines of the soil.

    In raised benches steaming in an effective control since the symphylids will not crawl up or down the outside of the bench legs. Soil in ground beds with a concrete bottom may also be steamed with good control. In ground beds with no bottom, the pests move down as the soil becomes warmer when steaming and then return when the soil cools. Lindane applied as a drench is very effective.

23. Termites or White Ants - These differ from regular ants in that they do not have a slender waist. These insects are pale or creamed-colored, soft bodied, about ¼ inch in length, with well-developed heads and jaws. They tunnel in the soil and may enter the plant through wooden bench legs and bottoms. They bore into the stems of mums, geraniums and other plants, and affected plants generally wilt and die. They avoid light and will generally remain undiscovered until the damage is done.

INFORMATION SHEET

Termites in swarms are in the reproductive stage where they have wings and the bodies are nearly black. Plant damage is serious, and should the termites get into wooden building supports, they can cause collapse of the structure. DDT and chlorodane are the chemicals most widely used to control them, but experienced personnel should be called in to treat the area. The soil may be drenched with either of the control materials as used for sprays, applying 1 to 2 pints per sq. ft.

24. White Grubs - These are the larval form of May or June beetles. They chew the roots of various plants. They are usually brought in with the soil from the field, and sterilization will control them. DDT, chlorodane, dieldrin or lindane applied as soil drenches is effective.

25. Wireworms - These are the larvae of click beetles and are generally hard-shelled and brown in color. They chew the roots of plants and outer scales of bulbs. Sterilization is effective. Lindane, chlorodane or dieldrin may be applied as soil drenches with good results.

B. Piercing Sucking Insects:

1. Aphids and Plant Lice - These are well-known insects that attack nearly all florist plants. They infest the younger growth of leaves or buds and cause injury by sucking the juices, which causes distortion of the tissues. They secrete a honeydew which drops onto the foliage, and very often a black sooty mold grows on the area.

   In the greenhouse, the female aphids, when they are mature, give birth to living young. The female lives only 20 to 30 days, but in that time may produce 60 to 100 other females, which after 6 to 7 days are mature and repeat the cycle. From this it is easy to see how aphid populations build up so quickly.

   There are numerous kinds of aphids. Some, like the chrysanthemum aphid, are specific to one crop. Others, like the green peach aphid, are found on a variety of plants. They may be greenish, yellowish, pink, purplish, brown or black, depending upon the species.

   Aerosols of dithio, parathion, and OMPA are effective as are sprays of malathion, lindane and parathion. Lindane and parathion in dust form are useful. Sys-

INFORMATION SHEET

tox applied to soil is slow to act but quite effective and longlasting.

Root aphids are grayish in color and covered with a fine powdery wax. They are usually found on roots of plants, but in heavy infestations they crawl up on foliage. They suck the juices of plants and seriously weaken them. Iris, tulips, lilies and other bulbs are sometimes infested before forcing and under high temperature of the greenhouse the insects quickly multiply to epidemic proportions. Root aphids may also be troublesome on ferns, palms and poinsettias.

Since ants carry them from plant to plant, complete control can only be obtained if both pests are eradicated. Soil sterilization or lindane, chlorodane or dieldrin soil drenches are effective control, but the latter treatment will not penetrate bulb scales where the insects may be found in large numbers. Hot-water treatment should be given at the time of harvest. Iris bulbs and gladiolus worms can be dusted with 1% lindane while in storage for control of aphids beneath the scales.

2. Broad Mite - This is quite similar to the cyclamen mite, but it is found on the underside of the leaves rather than just in the crown. See cyclamen mite for control.

3. Bulb Mites - There are several species of these and they attack narcissus, lilies, tulips, hyacinths and other miscellaneous bulbs. It has been assumed for years that mites were not particularly harmful and that they fed on dead tissue, but everlasting bulb troubles are believed in part to be due to mites.

   The female deposits eggs in the tissue at the base of the bulb which hatch in a few days into 6 legged larvae. After boring into the tissue they feed for several days then are quiescent for 2 days , then emerge as adults which mate, and begin laying eggs. Depending unon temperature, the life cycle can be completed in 9 to 27 days and large populations may occur. The adults can be seen with a hand lens; it is globular, almost transparent, and slow moving. The injury causes reddish-brown spots or streaks on the bulbs scales or flower stems which were within the bulbs. Growth of the bulb in the region where mites have done a great deal of damage. Dipping bulbs in the region where mites have done a great deal of damage. Dipping bulbs for 10 minutes in 122 degrees F. water to which nicotine sulfate has been added, mak-

INFORMATION SHEET

ing the dilution 1 to 400 will kill them, but may cause some injury.

4. Chrysanthemum Gall Midge - Small galls on the foliage and stems are evidenced of this pest, which can be serious enough to deform the growth. Female adults, which are flies reddish to orange-yellow in color, lay orange colored eggs on the upper foliage. The eggs hatch in 3 to 16 days and immediately the young larvae enter the plant tissue and begin feeding. This insect causes a small growth of the tissue, which is the gall that increases in size as the larvae grow. Pupation occurs within the gall, and the adult emerges between midnight and early morning, leaving a white papery skin as evidence that it is fully matured. The life cycle from egg to adult is completed in about 35 days, and the adult dies in 1 or 2 days time. Control is rather easy with DDT, parathion or lindane.

5. Cyclamen Mite - The adult mite cannot be seen without the aid of lens. It will be found either at the stem tip or in the basal portion of the flowers. It is almost transparent and somewhat glossy. Females lay eggs on the young leaves at the tip which hatch in 7 to 11 days. The nymphs have three pairs of legs at first and feed for about 7 days after which they are quiescent for 3 to 4 days. Following this the eight-legged adult mite is produced, which lives 2 to 3 weeks.

   The sucking of the mite on the very young tissues cause a distortion of the leaves or in some cases practically a complete cessation of new growth. With African Violet Gloxinia and Gynura the center or crown of the plant becomes whitish because of the development of the hairs without corresponding leaf growth. Other plants commonly affected are cyclamen, begonias, English Ivy snapdragons, hydrangeas and some foliage plants, though others are by no means immune. The new growth is generally crippled and twisted with progressively smaller leaves, until growth may cease entirely. Because there is no pest visible to the eye, it has often been puzzling to florists to diagnose the trouble.

   Best control is with endrin sprays plus a spreader. Methyl bromide fumigation is effective but may injure the plants. Kelthane sprays are effective.

INFORMATION SHEET

6. Greenhouse Orthezia - This is an insect closely related to scales and mealy bugs. The nymphs are dark green, wingless, and about the size of a pinhead. The female however, carries an egg sack attached to her body. It is whitefringed and the pest is easily identified from its striking appearance. It attacks the same kinds of plants as mealy bugs and control is the same as for this pest.

7. Greenhouse White Fly - The female white fly can lay as many as 100 eggs and attaches them to the underside of the leaves in a ring, or circle on a very short stalk. These hatch in 10 to 12 days into small greenish nymphs which begin sucking the juices of the tissues. In 4 weeks time they become adults which are four winged, very white in color, and fly when disturbed. They feed on plants for a period of 30 to 40 days.

   Damage can be severe if the infestation is heavy. A mottling of the foliage not unlike that caused by red spider is evident. Foliage is often blackened by the sooty mold fungus that develops on honeydew secreted by white flies. DDT or parathion is effective.

8. Leaf Hoppers - These are small mottled or speckled insects, green, yellow, brownish or multicolored. They suck the juices of plants, which is sometimes serious They may also transmit virus diseases. Aster and mums yellows are transmitted by these pests. DDT and parathion kill them, but transmission of the virus is accomplsihed before the insecticide takes effect.

9. Mealy Bugs - There are several species of mealy bugs which are closely related to scale insects. The long tailed mealy bug has four filaments protruding from the rear of the body for which it is named. The short tailed types which are most common include the citrus, coconot and mexican mealy bugs. These reproduce similarly in that the female deposits 300 to 600 eggs in a cottony waxy sack at the rear of her body over a period of 1 to 2 weeks. When egg laying is complete, the female dies. The sacks are generally found in leaf axils, in forks or branches or under the leaves. The eggs hatch in 10 days, and then the young unprotected mealy bugs crawl over the plant and suck the juices. Soon a waxy covering forms which protects them, and they move slowly over various parts of the plants. At this time they are whitish to gray in color. The males pupate and emerge as winged insects to mate with the female. Males die shortly afterward and at no time feed on the plant. About 30 days is required for one generation. Ants carry mealy bugs in the greenhouse, and both pests should be eradi-

INFORMATION SHEET

cated.

Malathion and parathion sprays are effective, and the latter may be used as an aerosol or dust. Dithio aerosols are also useful. Applications every 7 to 10 days are necessary to kill the pests, and it will be noted that the insecticides are most effective on younger pests.

10. Red Spider or Two Spotted Spider Mite - Although a mite rather than a true insect, this pest is probably the most troublesome of all under glass. The young and adults suck juices of the leaves and petals, generally on the underside. Affected foliage becomes lightly mottled and eventually may turn a light bronzy color when the infestation is severe. A light webbing on the underside of the foliage is indicative of the beginning of a heavy infestation. Soon the webs may envelop the upper portions of the plants. Heavily infested foliage turns brown and dries, while somewhat smaller population can do the same to flowers.

The female adult lays two to eight eggs per day individually on the surface of the foliage or flower and may produce 50 to 100 eggs during her lifetime. These hatch in 4 to 5 days, and the first nymphs have three pairs of legs; all later instars have four pairs of legs. The females molt three times during their life, the males twice. Two dark spots can usually be seen on their bodies when viewed from above under a glass. The mites may be greenish, yellowish or red in color and are quite small, about 1/50 inch long.

A generation is usually completed in 10 days time at 80 degrees F., in 20 days at 70 degrees F. and many take several months in cooler temperatures. All stages of a generation may be found simultaneously, and the rapidity with which they increase makes prompt application of control measures a necessity.

Red spiders on roses are more difficult to kill than those on other plants. In addition, there are strains resistant to certain insecticides, and this further complicates control. Aside from mutations which could account for such resistance, it is believed that the continued use of one insecticide is greatly to blame for the development of these hard-to-kill strains. Although control may appear adequate, a few spider mites remain alive, and these give rise to progeny which are not killed when the same insecticide is used. Alternation of various control materials is suggested to avoid rapid development of resistant strains.

INFORMATION SHEET

Non-resistant red spiders can be killed by TEPP sprays or bombs, and parathion or aerosol spray or dust form is very useful on a wide variety of crops. Sprays of aramite, chlorobenzilate, or malathion are quite effective. The aerosol form of aramite, chlorobenzilate dithio, malathion, or OMPA can also be used, but there may be more variation in control than with other methods of application. Systox applied to the soil kills the red spider on the newer growth; those on the older foliage are unaffected.

Phosphate-resistant red spiders are those which no longer can be killed by many of the organic phosphate materials. For these aramite, as either an aerosol, spray, or vaporization from steam pipes is suggested. Although dithio is an organic phosphate, it is often effective on the strains resistant to other organic phosphates. Chlorobenzilate sprays or aerosols may also be used.

Aramite-resistant mites can usually be controlled by alternation of dithio, chlorobenzilate and OMPA bombs.

Red spider adults can often be killed, but the eggs are unaffected by a great number of insecticides. Nymphs that hatch from eggs will buildup a new population in a suprisingly short time. TEPP and dithio kill only the adult and active young and have no residual action so that applications must be made every 3 days until the infestation is gone. This also applies to a considerable extent to other insecticides. Regular application must be made until the plants are free of the pest.

11. Scale Insects - There are numerous hard-shelled and soft-shelled scale insects which attack florist plants. The first instar scale in unprotected and is most susceptible to insecticides. Honeydew secreted by scale often may support a black sooty mold, which is unsightly. Scales suck the juices of leaves and stems and weaken the plant.

Malathion sprays or dithio bombs are useful but must be applied regularly because thay are most effective in killing the crawlers, which are the unprotected young. Parathion may kill some kinds of scale, but is not effective on others.

INFORMATION SHEET

12. Spittle Bug - Although not a serious pest, it sometimes attacks mums and causes abnormal branching or distorted growth. The nymphs suck the juices of the plant and hide in a froth, or spittle, which they excrete on the stem or in leaf axils. Lindane or dieldrin is effective.

13. Tarnished Plant Bug - The adults live over in trash and weeds and in spring lay eggs in leaves, stems or flowers or various plants. The nymphs and adults feed by inserting their sucking mouth-parts into the stems near the tip and cause abnormal branching of mums, asters, and other plants. It is believed that some toxic substance is injected which causes death of the tissue and resulant branching. The adults are about ¼ inch long, flattened, somewhat oval in appearance, and are brownish in color, mottled with white, yellow, brown or black in irregular patches. They are most troublesome on plants outside but occasionally may cause damage in the greenhouse.

    Dieldrin is a very effective control, as are parathion, chlorodane and DDT.

14. Dagger Nematode - Root tips are attacked by the dagger nematode, which feeds in a somewhat similar fashion to the meadow except it does not bore within the root. The root tips stop growing and become somewhat stubby. The plants are stunted. These nematodes move about freely in the soil. Control is similar to root-knot nematode.

15. Foliar or Leaf Nematode - This nematode lives at the basal part of the plant. The small worms from one leaf to another through films of moisture. They enter the leaf through the stomata and suck plant juices.

    On chrysanthemum, wedge or pie shaped brown areas develop between the main veins of a leaf, indicating the presence of this pest. The birds nest fern and other ferns are attacked and portions of the fronds or leaves turn brown to the mid-vein. Swellings on the petioles of African Violets can be caused by foliar nematodes, and when they are in the leaf blade, it is brown and discolored between veins when viewed from below. Browning of the margins of Melior begonias is due to foliar nematode.

    Parathion sprays are the best control since the material penetrates the leaf and kills the pest. The residue also is effective when the eelworm move from leaf to leaf.

INFORMATION SHEET

C. Rasping-Sucking Pests

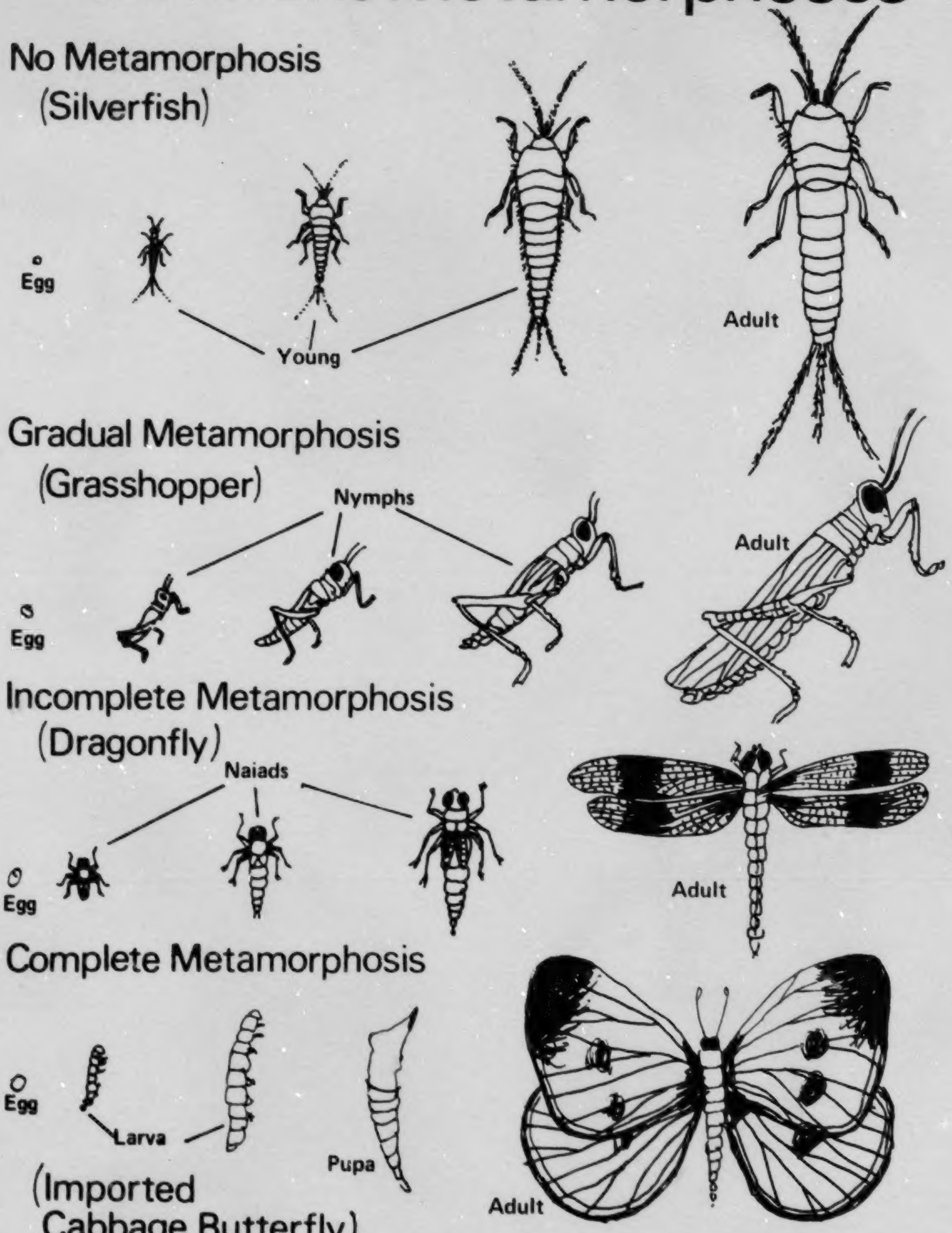
1. Thrips - There are several kinds of thrips which are troublesome on florist plants both in the greenhouse and out of doors. The nymphs and adults rasp the tissue with their mouthparts and then suck the juices which flow from the injured cells. The damaged foliage is usually silvery or whitish underneath and in severe infestations the injured foliage may turn brown. Petals of flowers are streaked, and roses may be malformed as a result of feeding.

   The female deposits eggs in slits in the tissue, and these hatch in 2 to 7 days into nymphs which immediately begin feeding. Thrips are small, narrow insects that can be seen with the naked eye, but the small nymphs may escape detection. In 20 to 25 days they are mature, and the life cycle is complete. The adults may be tan, yellow, brown or black.

2. Meadow or Root-Lesion Nematode - This is a rather common nematode, but it does not cause any knots on the roots. It bores into the outer layers of the roots and root hairs and feeds on the cell contents, leaving minute openings in the root surface. Fungus or bacteria can enter the plant, and this, together with the destruction of the cells by the nematode, can cause the plants to be stunted or may kill them. Many of the roots may be involved when the infestation is heavy. Control is similar to root-knot nematode.

Special appreciation is given to Ciba-Geigy for the use of their material on insect control.

Different Metamorphoses



No Metamorphosis (Silverfish)

Egg
Young
Adult

Gradual Metamorphosis (Grasshopper)

Nymphs
Egg
Adult

Incomplete Metamorphosis (Dragonfly)

Naiads
Egg
Adult

Complete Metamorphosis

Egg
Larva
Pupa
Adult

(Imported Cabbage Butterfly)

HOII-B1-U4-TM 2

The Orders of Insects

(Orders Important to Horticulture)

ORDER OF INSECT	EXAMPLE	MOUTH PART	METAMORPHOSIS*	MAJOR DAMAGES
1. Coleoptera (40% of all insects)	beetles, weevils, cereal leaf beetle	chewing	complete (egg, larva, pupa, adult)	crop and livestock stored grains
2. Diptera	Flies, mosquitoes, gnats	sucking, sponging, piercing-sucking	complete (egg, larva, pupa, adult)	crop and livestock production
3. Lepidoptera	butterflies, moths, Indian meal moth	adults – sucking larvae – chewing	complete (egg, larva, pupa, adult)	crops
4. Hemiptera	stink bug leaf bug	sucking	gradual (egg, nymph, adult)	crops
5. Homoptera	aphids, leafhoppers, cicadas, whiteflies, scale mealybugs	piercing-sucking	gradual (egg, nymph, adult)	crops
6. Orthoptera	grasshoppers, crickets, roaches	chewing	gradual (egg, nymph, adult)	crops
7. Hymenoptera	bees, wasps, ants	chewing chewing-lapping (bees)	complete (egg, larva, pupa, adult)	beneficial (bees) parasitic feeders on plants.
8. Ephemerida	mayfly	no mouth	incomplete	beneficial
9. Insecta	dragonfly	chewing	incomplete	beneficial predator on flies and mosquitoes

*Best steps for control are underscored

NOTE: Be sure to know whether insects are beneficial before controls are applied.

INSECT CONTROL

ASSIGNMENT SHEET #1 - COLLECTION OF INSECTS

Have the student collect, label and give control for 20 insects.

INSECT CONTROL

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

INSECT CONTROL

TEST

I. Match the terms listed below to the correct definition.

___A. Pesticide

___B. Parasite

___C. Insecticide

___D. Molt

___E. Metamorphose

1. An animal which lives off other animals.
2. Shed skin.
3. Change in form during development.
4. Substance that kills insects.
5. Name of chemicals that are toxic to some stage of a plant pest cycle.

II. List three beneficial aspects of insects.

A.

B.

C.

III. List four types of metamorphosis.

A.

B.

C.

D.

IV. Give one fact about no metamorphosis insects and identify.

V. Describe an incomplete metamorphosis insect and identify.

VI. Describe a Gradual Metamorphosis insect and identify.

VII. Describe complete metamorphosis insects and identify.

VIII. List the life cycle of insects.

A.

B.

IX. Tell how to reduce insect damage through control.

A.

B.

C.

D.

X. Name five lawn, five tree, five flower, five fruit, five vegetable and five nuisance insects.

A.
B.
C.
D.
E.

A.
B.
C.
D.
E.

A.
B.
C.
D.
E.

A.
B.
C.
D.
E.

A.
B.
C.
D.
E.

XI. Turn in assignment sheet #1 to instructor to be graded.

INSECT CONTROL

ANSWERS TO TEST

I. A. 5

B. 1

C. 4

D. 2

E. 3

II. A. Bees, wasps, butterflies pollinate flowers.

B. Products such as honey, wax and silk are produced by insects.

C. Food supply for fish, birds, etc.

III. A. No metamorphosis

B. Incomplete metamorphosis

C. Gradual metamorphosis

D. Complete metamorphosis

IV. A. They look like the adult when they hatch except for size.

B. Example - Aphid

V. Should contain the following information:

A. Located in the water in the immature stages.

B. The adults are found flying in the air.

C. The young insects are called naiads.

D. Naiads only slightly resemble the adult.

E. They grow for a time then molt, grow, then molt again.

F. At the last molt they develop wings.

G. Example - Stoneflies, mayflies

VI. Should contain the following information:

- A. The young resemble the adult except for the lack of wings.
- B. The young are called nymphs.
- C. After each molt, the young begin to resemble the adult.
- D. The nymphs and adults have the same food habits.
- E. Example - Aphids, grasshoppers.

VII. Should contain the following information:

- A. Most common type.
- B. Consist of four stages (egg, larva, pupa, adult)
- C. Larva is quite different from adult.
- D. Larva passes through several stages but does not resemble adult.
- E. When larva reaches maturity it transforms to the pupa.
- F. In the pupa stage it does not eat but drastic changes occur.
- G. In the pupa stage it changes from a worm to the adult body.
- H. Example - Moth, fly, beetle, bee.

VIII. A. Active season

- B. Dormant season

IX. A. Correctly identify the insect.

- B. Select the correct insecticide.
- C. By the use of predator insects.
- D. Knowledge of the insects life cycle.

X. Any five from information sheet to satisfaction of instructor.

XI. To satisfaction of instructor.

SECTION C

UNIT II

PLANT DISEASES

PLANT DISEASES

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to determine the causes of certain diseases and know what to do to control them. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms and definitions associated with plant diseases.

II. Name the three main causes of plant diseases.

III. List the two types of plant diseases.

IV. List three pathogenic diseases.

V. Describe non-pathogenic diseases.

VI. List two facts about bacteria.

VII. List four diseases caused by bacteria.

VIII. List six characteristics of disease bacteria.

IX. List three facts about fungi.

X. List two characteristics of fungi.

XI. List three facts about viruses.

XII. Know four characteristics of viral diseases.

XIII. Know ten diseases of ornamentals and how to cure them.

PLANT DISEASES

SUGGESTED ACTIVITIES

I. Instructor:

  A. Provide students with objective sheet.

  B. Provide students with information and assignment sheets.

  C. Make transparencies.

  D. Discuss terminal and specific objectives.

  E. Discuss information and assignment sheet.

  F. Give test.

II. Student:

  A. Read objectives.

  B. Study information sheet.

  C. Complete each assignment sheet.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objectives

  B. Information sheets

  C. Transparency masters

    1. TM 1 - Fungus Diseases

    2. TM 2 - Bacterial Diseases

    3. TM 3 - Nematode Diseases

    4. TM 4 - Life Cycle of Smuts (Fungus)

  D. Assignment sheet

    1. Assignment sheet #1 - Collecting Diseased Plants

E. Test

F. Answers to test

II. References:

A. Horticulture II, Curriculum Manual, New Mexico State Department of Education.

B. Ornamental Horticulture for Vo. Ag. in Alabama.

PLANT DISEASES

INFORMATION SHEET

I. Definitions:

   A. FUNGI - Tiny, thread-like plants.

   B. BACTERIA - Single celled organism.

   C. NEMATODE - Small worm-like organisms that suck plant juices from plant cells.

   D. PARASITE - Fungi that obtains food from living plants.

   E. SAPROPHYTES - Fungi that obtains food from dead plants.

II. Three main causes of plant diseases.

   A. Fungi

   B. Bacteria

   C. Viruses

III. Two types of plant diseases.

   A. Pathogenic - Disorders that arise from living organisms.

   B. Nonogenic - Disorders that arise from causes other than living organisms.

IV. Three pathogenic diseases.

   A. Bacterial

   B. Viral

   C. Fungal

V. Non-pathogenic diseases.

   A. Disease that arises from causes other than living disease causing organisms.

   B. Not always considered a disease.

INFORMATION SHEET

VI. Two facts about bacteria.

A. One celled plants that increase by division.

B. Obtain their food from living or dead organic material.

VII. Four diseases caused by bacteria.

A. Soft rot

B. Leaf spot

C. Gall

D. Wilt

VIII. Six characteristics of disease bacteria.

A. Live in the soil or on dead plants.

B. Spread by wind, rain, man, animals, plants.

C. Must enter the plant through some sort of wound.

D. May produce toxins poisonous to the plant.

E. May plug the vascular tissues.

F. Dead cells or spot result where they enter the plant.

IX. Three facts about fungi.

A. Obtain food from living or dead organic matter.

B. Microscopic in size.

C. May be a powdery mildew on the surface of plant.

X. Two characteristics of fungi.

A. Can enter a healthy plant.

B. Produces a toxin harmful to plant cells.

XI. Three facts about viruses.

A. Spread by means of insects that sucked juices of infected plants.

INFORMATION SHEET

- B. Spread by contact.
- C. Spread through vegetative propagation.

XII. Four characteristics of viral diseases.

- A. Stunting
- B. Yellowing
- C. Streaks
- D. Mosiac Patterns

XIII. Diseases of ornamentals (Following pages)

DISEASES OF ORNAMENTALS

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
African Violet	Botrytis Blight	Leaves blighted and decayed	Zineb	1½ lbs. per 100 gal. (1 Tbs. per gal.)	2-3 spray applications at 7 day intervals as needed.
	Crown Rot	Crown turns soft and mushy	Ferbam	2 lbs. per 100 gal. (2-2/3 Tbs. per gal.) plus Isobac 20--1/8 teaspoon per gal.	Drench soil and crown ½ pint per pot. Repeat every 1-2 weeks as necessary for control.
	Nematodes Powdery Mildew	Light powdery coating on leaf surface.	Karathane or Mildex	4 ozs. per 100 gal. (½ tsp. per gal.) plus a spreader sticker	See Soil Sterilization. Use as necessary to keep under control. See Label.
Ajuga	Crown Rot	Circular areas killed out. White mold usually present on trash and ground.	Terracolor 75% W.P.	2 Tbs. per gallon	Drench, use one pint per each sq. ft. of soil.
Amaryllis	Leaf Spot	Red spots on leaves and flowers	Formaldehyde	Soak bulbs 1 hr. in water then in solution of 1 part formaldehyde to 119 parts water 30 min.	
			Zineb	1½ lbs. per 100 gallons of water. (1 tablespoon per gallon.)	Spray at 10-14 day intervals needed during growing season.
Arborvitae	Blight	Browning of plant from lower parts up, shedding of foliage.	Bordeaux Mixture	4-4-50	Remove dead and diseased portions. Spray at 10-14 day intervals as needed
			or Dyrene		" " " " "
			or Daconil 2787		" " " " "

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations & Remarks
Ash	Anthracnose	Dead leaf spots and leaf scorching.	Ferbam 76% W.P.	2 lbs.per 100 gal. (2-2/3 Tbs. per gal.)	Spray every 7-10 days as necessary for control plus spray with Dormant liquid lime sulfur. See in back of book.
Aspen - See Popular					
Aster	Botrytis Stem Rot	Blackened areas on stems	Zineb 75% W.P.	1½ lbs.per 100 gal.(1 Tbs.per gal)	Spray 2-3 times at 7-10 day intervals as needed.
	Leafspots	Dark, dead spots on leaves	Zineb 75% W.P.	1½ lbs.per 100 gals. (1 Tbs.per gal.)	Spray every 7-10 days as necessary to control.
	Yellows	Leaves light yellow, blooms small, greenish mottled.	See Remarks		Check with entomologist for leaf hopper control as this is the vector.
	Wilt	Leaves and stems drooping. Plants dying and brown inside.			1. Resistant varieties. 2. New planting site. 3. See Soil Sterilizatio
Aucuba	Leafspot	Black spots on leaves, sometimes entire leaf or branch dies.	Zineb 76%	2 lbs.per 100 gals.	Spray at 7-10 day intervals as needed - remove affected portion of plan
			Maneb	1½ lbs.per 100 gals.	Same as above.
Azalea	Petal Blight-Ovulinia	Dark spots on white flowers, light spots on colored flowers; enlarging to make blossoms look scalded.	Zineb (65%)	2 lbs.per 100 gals. of water. (2 Tbs.per gal.)	Applications every 3 day during bloom. Note: Zineb will only control Ovulinia Blight.
	Petal Blight-Botrytis	Blighted areas usually coated with a grayish fungus	Thiram 75%	2 ga per 100 gals. water.(1-1/3 Tbs. per gal. water)	Apply every 3 days during bloom. Note: Thiram will control both Ovulimia and Boyrytis.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Azalea (continued)	Leaf Gall	Leaves, etc. become thickened, fleshy, curled pale green to white.	Ferbam	2 lbs. per 100 gallons of water	1. Remove galls as they are observed and destroy by burning. 2. First spray at end of bloom and thereafter at 10-14 day intervals until mid-June.
	Leafspot	Dead areas on leaves.	Zineb 75% W.P. or	1½ lbs.per 100 gal. (1 Tbs.per gallon)	Spray every 7-10 days as necessary to control.
			Ferbam 76% W.P.	2 lbs. per 100 gal. (2-2/3 Tbs. per gallon)	Same as above.
	Cutting Rot	Cuttings rotting and not rooting	Terraclor 75% W.P.	1 Tbs. per gallon	Drench 1 pint per each sq. foot of soil area.
	Rhizoctonia Leaf and Stem Blight	Steams and leaves are killed.	Terraclor 75% W.P.	1½ lbs.per 100 gallons (1½ Tbs.per gallon)	May injure some varieties. Spray as necessary for control, every 7-10 days.
	Phytopthora Root Rot	Plants become thin and leggy, branches wilt and die. Brown discoloration of wood in main roots and lower portion of stems.	Formaldehyde	1 part commercial formalin in 49 parts water.	½ gal. per sq. ft. of soil well in advance of planting.
	Chlorosis	Leaves yellowing between veins. Check pH and if above 6.0 treat as follows: Check soil for nematodes.	Sulfur	1 lb. per 100 sq. ft.	Soil treatment to lower pH Do not repeat until soil tested 1 year later to see if needed.
			Iron Sulfate	2 lbs.per sq. ft. or 1 oz. per 1 gallon water.	As sprays a quick response is obtained; 2-3 week intervals as needed.
Barberry	Bacterial Leafspot	Small, purple brown spots on leaves.	Bordeaux	8-8-100	Spray every 7-10 days as necessary to control.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Basswood (See Linden)					
Begonia	Bacterial Leafspot	Small black spots on leaves.	Bordeaux	8-8-100	
	Blotch	Leaves and flowers turn brown and die.	Ferbam	2 lbs. per 100 gallons	1. Every 7-1- days as neede 2. Remove diseased parts.
	Botrytis Blight	Tan to brown spots on blooms.	Zineb 75% W.P.	1½ lbs. per 100 gallons. (1 Tbs. per gallon)	
	Cutting Rot	Cuttings rotting and not rooting.			See Damping-Off Drenches
	Damping-Off	Plants rotting off at base	Methyl Bromide	2 lbs. per 100 sq. ft.	Sterlize soil. See Damping off Drenches.
			Semesan	1 tablespoon per gallon	Drench soil with solution.
	Foliar Nematode		Parathion 15% W.P.	2 lbs. per 100 gallons	Very Poisonous - not for homeowners. Spray foliage and drench soil. Use extre caution.
	Root Knot Nematodes	Knots on roots., plants stunted or dying.	Methyl Bromide	2 lbs. per 100 sq. yds.	Sterlize soil.
Boxwood	Nematodes	Leaves bronze to yellow in color. Roots show root rot and root knots.	Nemagon or Fumazone		Boxwoods not properly watered and fertilized, als show this type of injury. Check soil for nematodes.
Butternut	Anthracnose	Dead spots on leaves	Bordeaux	4-4-100	Spray every 7-10 days as necessary for control
Calla Lilly	Root Rot	Roots brown to blackish	Formaldehyde 37%	1 qt. in 12 gallons of water	Soak rhizomes for 1 hour. For soil sterilization see same.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Camellia	Flower Blight	Small brown spots on flowers followed by general discoloration. Hard black bodies may be seen on old blossoms as they cling to the plansts.	Ferbam 76% or Terraclor	½ lb.per 5 gal.of water per 20 sq. ft. or ½ lb. of 20% dust per 20 sq. ft.	If observed report this disea to the Plant Disease Clinic. Remove and destroy all old and fallen blooms as soon as possible. If chemicals are used, apply in early December or January before spores have formed.
	Leaf Gall	See Azalea			
	Phytophtora die back	See Azalea Young twigs wilt and die. Cankers on limbs.	Bordeaux Mixture	4-4-50	Remove all affected portions. Apply Bordeaux sprays during time of greatest leaf fall at 10-14 day intervals.
Carnation	Alternaria Blight or Branch Rot	Blight or rot occurs at leaf bases and around nodes which are girdled.	Ferbam 76%	1½ lbs.per 100 gallons	Spray at 7-10 intervals as necessary for control.
	Rhizoctonia Stem Rot		Terraclor 75 W.P.	3/4 lb. per 100 gal.	Drenches 400 sq. ft of bed
Catalpa	Leafspots	Dead spots in leaves	Bordeaux	8-8-100	Spray every 7-10 days as necessary for control.
	Powdery Mildew	Grayish-white powder on leaves.	Wettable Sulfur	2 lbs. per 100 gallons	Spray every 7-10 days as necessary for control
Chestnut	Leafspot	Dead areas in leaves	Bordeaux or Captan 50% W.P.	8-8-100 2 lbs. per 100 gallons	Spray with either every 7-10 days as necessary for control.
Chrysanthemum	Septoria Leafspot	Black spots on leaves merging causing death.	Ferbam Zineb	2 lbs. per 100 gallons water	Every 7 days prior to bloom.
			Zineb	1 lb. per 100 gallons water	Every 7 days after plants start bloom.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Chrysanthemum	Ray (flower) Blight	Discoloration of flower heads.	Zineb	1 lb. per 100 gallons water.	Every 3 days during bloom if this disease is observed.
	Foliar Nematodes	Brown, wedgeshaped dead areas on leaves.	Parathion 15% wettable	2 lbs. per 100 gallons of water.	Spray plants 4 times at 7 day intervals. Drench soil around base of plants with same solution. Use precautions. Parathion extremely dangerous to humans.
	Powdery Mildew	Light gray powder on leaves.	Karathane or Milded	4 oz.per 100 gal. (½ tsp. per gal.)	Spray every 7-10 days as necessary for control.
	Root and Stem Rot	Roots rotting, lower leaves brown.	Dexon 35% W.P. Plus - Terraclor 75% W.P.	8 oz.per 100 gal. Plus 4 oz. per 100 gals.	Use ½ pint per pot. Note: For bed or field mums use Dexon 1½ lbs. plus 3/4 lb. Terraclor per 100 gal. and drench 400 sq. ft. of bed area.
Clematis	Leafspots	Small dark spots on leaves with reddish margins.	Zineb 75% or Ferbam 76% W.P.	1½ lbs.per 100 (1Tbs. per gal.) 2 lbs. per 100 gals. (2-2/3 Tbs. per gal.)	Spray every 7-10 days as necessary for control.
	Stem Rot	Stems are girdled	Same	Same	Same as leafspots
Cottoneaster	Fireblight	Stems and twigs blight and die.	Streptomycin or Bordeaux	100 ppm 1-3-100	Do not use on cottoneaster racemiflora. Spray either during bloom period. One at beginning and every 5 to 7 days until bloom is over.

DISEASES OF ORNAMENTALS (Cont'd.)

Crop	Disease	Symptom	Material	Rate	Recommendations and Remarks
Crabapple	Cedar-Apple Rust	Orange pustules on leaves.	Ferbam 76% W.P.	2 lbs. per 100 gallons	Spray every 5-7 days beginning as leaves come out and continue until 3-4 sprays.
	Fireblight	Dead blackened twigs	Streptomycin	100 ppm	Spray during bloom-See Apple Spray Schedule.
	Scab	Dark greenish-gray spots on leaves & fruit	Captan	2 lbs. per 100 gallons	See Apple Spray Schedule.
Crepe Myrtle	Powdery Mildew	White, powdery, mold on leaves.	Sulfur or	Fine dusting	Do not use sulfur when temperatures are above 90°F. 7-10 days as needed.
			Karathane (Mildex)	2/3 Tbs. per gallon	Every 7-10 days as needed.
Dahlia	Botrytis Blight	Fading and browning of petals and death of leaves and shoots.	Zineb	1½ lbs. per 100 gallons of water	Spray every 5-7 days as needed for control.
	Wilt	Soft rot of stem at ground, sudden wilting.	Formaldehyde	1 part formalin in 49 parts water.	½ gallon per sq. ft. of soil well in advance of planting.
	Powdery Mildew	White, powdery mold on leaves.	Sulfur	Fine dusting sulfur.	As needed.
			Karathane (Mildex)	2/3 Tbs. per gallon	7-10 days as needed.
Delphinium	Crown rot	Plants dying, white mold around base of plants.	Terraclor 75% W.P.	1 lb. per 100 gallons (1 Tbs.per gallon)	Drench steams and use 1 pint per each square foot.
	Powdery Mildew	Grayish-white powder on leaf surface.	Wettable Sulfur or	2 lbs. per 100 gallons	Spray every 5-7 days as needed.
			Karathane	8 oz. per 100 gallons (1 Tsp. per gallon)	

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Dieffenbachia (Dumb-Cane)	Bacterial Soft Rot	Cuttings rotting	Streptomycin	200 ppm	Dip cuttings 15 minutes.
	Bacterial Leafspot	Dark dead spots on leaves.	Streptomycin	200 ppm	Spray every 5-7 days as necessary for control.
Dogwood	Spot Anthracnose	Roundish spots on leaves bracts and flowers, usually with purplish borders.	Captan 50%	2 lbs. per 100 gallons	SPRAY SCHEDULE 1. When flower buds start to open. 2. At petal fall. 3. Four weeks later. 4. After buds for next season's flowers formed. 5. Also, make a dormant application of liquid lime sulfur. See this Spray Schedule.
Douglas Fir	Needle Cast	Yellow spots appear on needles near the tip. Spots enlarge and turn reddish-brown.	Bordeaux	8-8-100 2 lbs. per	Spray every 7-10 days as young needles emerge for 3-4 sprays. Thereafter, as necessary to keep under control.
Elm, American	Black Leafspot	Black, dead spots in leaves.	Ferbam 76% W.P.	2 lbs. per 100 gallons	Spray as young leaves come out every 7-10 days for 3 to 4 applications.
	Phloem Necrosis	Leaves slowly yellow and drop off, decline of entire tree, rarely branch. Diseased trees soon die.	None		Remove diseased trees. Also, make a dormant application of liquid lime sulfur. See Dormant Spray Schedule.
Euonymous	Powdery Mildew	Grayish white powder on leaves.	Wettable Sulfur or Karathane	2 lbs. per 100 gallons 8 oz. per 100 gallons	Spray every 7-10 days as necessary for control with either.
Firethorn (See Pyracantha)					

DISEASES OF ORNAMENTALS (cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Foilage Plants	Cutting Rots	Cuttings rotting	Terraclor 75 W.P. plus Isobac 20	1 lb. per 100 gallons. (1 Tbs. per gallon) plus 2 oz. per 100 gallons (1/8 tsp. per gallon)	Drench using 1 pint per sq. ft.
Gardenia	Sotty Mold	Black moldy growth on surface of leaves.	See Remarks		Control insects--the fungus feeds on "honeydew" secreted by insects. Wash mold off with strong stream of water, using a hose after applying a detergent solution (½ tsp. per gal.) 2-4 hrs. earlier.
Geranium	Leafspot and Blossom Blight	Brown water-soaked areas which later dry and grayish-brown masses of fungus spores become evident.	Captan or Ferbam or Zineb	2 lbs. per 100 gallons. 1½ lbs. per 100 gallons 1 lb. per 100 gallons water.	1. Remove affected parts. 2. Spray as needed at 7-10 day intervals. 3. Reduce humidity. 4. Propagate from healthy plants. 5. Use sterilized soil for potting. Soil sterilization, sanitation, and use of disease free cuttings.
	Bacterial stem rot, black leg	Stems turn black and rot.	See Damping-off Drenches.		
Gladiolus	Corm Rots (before storage or before planting.)	These rots are common	N.I. Ceresan	1 oz. per 3 gallons.	Cull diseased corms and dip other for 5 minutes. Dry and store.
	Corn Rots (before storage)		Dowicide-B	1-3/4 to 2 lbs. per 100 gal.	Soak for 20-30 minutes within 3 days of harvest

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Gladiolus	Corm Rots (before planting)	Rotting of corms	Ceresan 100	2 pts. per 100 gallons	Soak for 10 minutes just before planting.
	Yellows	Plants yellow, corms rot.	Ceresan 100	2 pts. per 100 gallons	Soak 10 minutes just before planting or use resistant varieties.
	Curvularia Leaf and Flower Spot	Oval, tan to brown spots on leaves and stems.	Zineb 65%	1½ lbs. per 100 gallons	Spray every 7-10 days in normal weather as needed.
			Maneb 70%	2 lbs. per 100 gallons	In wet weather spray every 3-5 days.
	Botrytis Flower Blight	Brownish spots on leaves and flowers.	Zineb	1½ lbs. per 100 gallons.	As for curvularia leaf and flower spot above.
	For Sprouted Corms	Disinfecting.	Captan 50-W	12 lbs. per 100 gallons	Soak for 20 minuts just before planting.
Grasses (See special section on Disease Control in the back)	Brown Patch (Turf & lawn)	Brown circular areas sometimes in rings, and rings interlock.	Dyrene or Tersan OM	28 Tbs. per 1000 sq. ft. 30 level Tbs. 1000 sq. ft.	As recommended: First spray...now Second spray..14 days after first Third spray:..21 days after second.
			or Panogen Turf Spray	1½ Fluid oz. per 1000 sq. ft.	
	Dollar Spot	Small brown dead areas (sometimes size of silver dollar) enlarging gradually)	As for Brown Patch	As for Brown Patch	Same
	Helminthosporium Leafspot	Light to dark brown spots on leaves frequently entire leaves die	As for Brown Patch	As for Brown Patch	Same
	Nematodes	Grass stunted, root system very poor.	Nemagon or Fumazone	As per mfg's. label	Treat established lawns following recommednations. Have soil tested for nematodes.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Grasses (continued)	Nematodes	As above	Dasanit	See Remarks	Dasanit can be applied only by commercial applicators. Use 4 lbs. of 10% granular per each 100 sq. ft. Irrigate immediately with 1½ to 2 inches of water.
Hawthorn	Fabrea Leaf Blight	Dead spots in leaves, frequently falling out leaving shot hole appearance.	Zineb 75 W.P.		
	Fire Blight	Dead twigs, limbs, etc.	Streptomycin	100 ppm	2-3 times at 4-5 days intervals. Do not use on *Crategus mollis*. Prune and burn all dead twigs, etc.
	Leaf Blight	Dead spots in leaves	Captan 50 W.P.	2 lbs.per 100 gals.	Spray at 14-21 day intervals as needed.
	Fruit Spots	Dead areas in fruit	Captan 50 W.P.	2 lbs.per 100 gals.	Spray at 14-21 day intervals as needed.
	Rust	Yellow pustules on leaves.	Ferbam 76 W.P.	2 lbs.per 100 gals.	2-3 applications as leaves come out at 7-10 day intervals.
Hemlock	Twig and Branch Canker	Twigs die, cankers later appear on branches	Bordeaux	8-8-100	Spray every 7-10 days for 3-4 applications in early spring. Thereafter, as necessary for control
Hickory	Anthracnose	Brown dead areas on leaves	Zineb 75% W.P.	1½ lbs.per 100 gallons	Dormant spray of liquid lime sulfur and spray every 7-10 days for 2-3 applications after leaves first come out in spring.
Holly	Leaf rot in Cutting Beds	Leaves rot and drop off	Formaldehyde 37%--see remarks	1 pint in 6 gallons	
			Terraclor 75% W.P.	1 lb. per 100 gallons	Drench--using 1 pint of solution for each sq. ft.
	Tar Spot	Black spots on leaves	Ferbam 76 W.P.	2 lbs.per 100 gallons	Spray 2-3 times at 7-10 day intervals at first sign.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Hollyhock	Rust	Orange pustules on leaves, etc.	Zineb 75 W.P. or Ferbam 76 W.P.	1½ lbs. per 100 gallons 2 lbs. per 100 gallons	Spray with either every 5-7 days for 2 applications. Then as necessary for control
Honeysuckle	Powdery Mildew	Grayish-white powder on leaves	Wettable Sulfur	2 lbs. per 100 gallons	At first sign make 2 applications 5-7 days apart. Then as needed for control.
Hyacinth	Yellow Rot	Yellow water-soaked stripes begin at tips of leaves and go downward. These stripes turn brown and die. Cross section of leaves, stems, etc. show yellow slime oozing from vascular system.	See Remarks		Destroy all plants affected. Do not plant infected bulbs. Use Methyl Bromide, 2 lbs. per 100 sq. ft. before resetting new bulbs.
	Soft Rot	Affected bulbs give off foul odor. Diseased bulbs usually produce now flowers or blossoms fall off before unfolded.	See Remarks		1. Store bulbs in dry, cool place. 2. Avoid excessive watering.
	Gray Mold	Leaves yellow or brown at ends, they become rotted and covered with a gray mold.	Zineb 65% or Maneb 70%	1 lb. per 100 gallons 2 lbs. per 100 gallons	At 7-10 day intervals in weather as needed. In wet weather spray as often as every 3-5 days.
Hydrangea	Botrytis Bud Blight	Blight of dense flower clusters.	Zineb 75 W.P. or Captan 50 W.P.	1½ lbs. per 100 gallons 1½ lbs. per 100 gallons	Make 2-3 applications of either at first sign at 4-5 day intervals. Then as needed to control.
	Leafspot	Large brown spots on leaves	Ferbam	1½ lbs. per 100 gallons	Spray every 7-10 days as necessary.

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Hydrangea	Powdery Mildew	Undersides of leaves become covered with light-gray mold which turns brown in spots. Upper surface purplish brown in color, may remain green.	Karathane (Mildex)	2/3 lbs. per gal.	Repeat in 2 weeks if necessary. Cover upper and lower leaf surfaces thoroughly with spray.
	Root Knot (Have soil checked)	Plants stunted, frequently chlorotic.	Nemagon or Fumazone	As per mfg's label.	Treat soil prior to setting out healthy plants. These materials can be used around existing plants.
Iris	Soft Rot	Leaves fall over because of rotting at base. Rhizomes rotting.	Semesan	1 oz. to 3 gal. of water	Cut away diseased portions of Rhizomes and soak in this solution for 1 hour. Thoroughly soak soil with same solution prior to replanting.
	Leafspot	Irregular "eyespots" with grayish centers and dark brown borders	Zineb or Maneb or Phaltan 50-W	1 lb.per 100 gals. 1 lb.per 100 gals. 1½ lbs.per 100 gals.	Spray every 7-10 days as needed for control. Remove and burn badly infected leaves.
	Crown Rot	White mold at base of plants	Terraclor 75 W.P.	1 lb. per 100 gals.	Drench using 1 pint per sq. ft.
Iris, Dutch	Bulb and Stem Rot	Bulbs rotting, white mold present on stem at ground line and below, and on bulb. Tan to brown mustard seed-like fungus bodies present.	Methyl Bromide or Terraclor	2 lbs. per 100 sq. ft. 4 lbs. per 100 gals.	1 qt. per sq. ft. as drench at planting.
Ivy - Boston	Leafspot	Black spots on leaves.	Ferbam 76 W.P. or Captan 50 W.P.	2 lbs. per 100 gallons 2 lbs. per 100 gallons	Begin spray at first sign. Make 2-3 applications at 5-7 day intervals. Then as necessary.
	Powdery Mildew	Grayish white powder on leaves.	Wettable Sulfur	2 lbs. per 100 gallons	Every 5-7 days as needed.

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Ivy-English	Leaf Spot Twig Blight	Black spots on leaves twigs, etc.	Zineb 75 W.P. or Ferbam 76 W.P.	1½ lbs. per 100 gallons 2 bls. per 100 gallons	Make 2-3 applications at first sign 5-7 days apart. Then as needed.
Juniper	Twig Blight	Twigs turn brown and die.	Daconil 2787	2 lbs./100 gallons	Make 6-8 applications beginning in early spring at 21 day intervals. Use a spreader sticker and wet all parts of plant.
Larkspur	Crown Rot (Southern Blight)	Plants wilting and dying. White mold at base of stem.	Terraclor or Methyl Bromide	4 lb. per 100 gallons 2 lbs per 100 sq. ft.	1 quart per sq. ft. as a drench prior to planting. Repeat in 4-6 weeks.
Laurel, Mountain	Leafspot, Leaf Blight	Brown spots on leaves; leaves blighted and die.	Ferbam 76 W.P. or Zineb 75 W.P.	2 lbs. per 100 gallons. 1½ lbs. per 100 gallons	Spray 2-3 times in early spring at 7-10 day intervals. Thereafter as needed.
Leucothoe	Leafspots	Brown dead areas on leaves.	Same as Laurel	9	Same as Laurel
Lilac	Bacterial Slight, Leaf Blights, Phytophthora Shoot Blights	Dead areas on leaves, leaves blight and die	Dyrene	4 lbs/100 gallons (4 T.per gallon)	Make 2-3 applications in early spring as leaves come out at 7-10 day intervals. Then as needed
	Powdery Mildew	White to gray powder on leaves.	Wettable Sulfur or Karathane	2 lbs. per 100 gallons 8 oz. per 100 gallons	At first sign make 2-3 applications at 5-7 day intervals. Then as needed.
Linden or Basswood	Leafspots	Dead spots on leaves.	Maneb	8-8-100	Dormant liquid lime sulfur spray and spray 2-3 times early spring at 7-10 day intervals with Maneb. Thereafter as needed.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Lily	Gray Mold	Leaves and flowers with brown spots covered with light gray mold.	Maneb	1½ lb. per 100 gallons	At 7-10 day intervals as necessary.
	Bulb Rot	Basal leaves from affected bulbs become yellow or purple and die early.	Formaldehyde	1 part commercial formalin in 49 parts water.	Soak dormant bulbs for 30 minutes. Discard badly affected bulbs.
	Mosaic and Fleck	Elongate necrotic spots and mottling on leaves.	See remarks		1. Caused by a virus. 2. Destroy affected plants. 3. Control aphids, consult entomologist for these measures.
	Root Rot	Roots brown to black and rotting.	Dexon 35 W.P. plus Terraclor 75 W.P.	8 oz. per 100 gallons plus 4 oz. per 100 gallons	Apply ½ pint per pot.
Loquat	Fire blight	Dieback of twigs and branches.	Streptomycin	100 ppm	Cut well below last visible symptom on limb and burn affected parts. Spray 2-3 times early spring 5-7 days apart.
Magnolia	Algal Leafspot	Greenish-tan circular spots on leaves.	Fixed Copper	1½ lbs. per 100 gallons	Spray 2 times at first sign at 7-10 day intervals. Then as needed.
Maple	Leafspot and Anthracnose	Dead areas on leaves.	Ferbam 76 W.P.	2 lbs. per 100 gallons	At first sign spray 2-3 times at 10-14 day intervals. Then as needed.
Mimosa	Mimosa Wilt	Leaflets and twigs wilt and die, tree gradually dies usually a limb or two at a time. Wood discolored under bark.	See Remarks		Plant resistant varieties obtainable from some nurseries.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Mock Orange	Leaf Spot	Dead areas in leaves	Zineb 75	1½ lbs. per 100 gallons.	At first sign spray 2-3 times at 7-10 day intervals. Then as necessary.
Mountain Ash	Fire Blight	Dead twigs.	Streptomycin	100 ppm	Spray 2-3 times in early spring
	Leafspot	Dead areas in leaves	Ferbam 76 W.P.	2 lbs. per 100 gallons	At first sign spray 2-3 times a 7-10 day intervals. Then as needed.
Narcissus	Bult and Stem Nematodes	Flowers do not form from badly infested bulbs. Infested leaves have small swellings which can be felt by pulling leaves through fingers.	See Remarks		1. Bulb treatment suitable only for commercial growers. Consult pathologist for details if needed. 2. Destroy affected bulbs. 3. Treat soil with Methyl Bromide, 2 lbs. per 100 sq. ft. before replanting. 4. Obtain new bulbs.
	Basal Rot (Before storage)	Discard rotted or diseased bulbs.	Dowicide B	3 lbs. per 100 gals.	Soak for 15 minutes within days after harvest.
	Basal Rot-(Before planting)	Discard rotted bulbs	Dowicide B or 2% Ceresan	3 lbs. per 100 gallons 2 oz. per 1 gallon.	Soak for 15 minutes just before planting. Soak bulbs 5 minutes.
	Leaf Scorch	Spots on leaves are brownish with a fellow margin.	Dyrene	4 lbs./100 gals. plus spreader	Every 10-14 days after foliage is 4-6 inches high.
Oaks	Oak leaf Blister	Circular raised areas on upper leaf surfaces up to ½" in diameter. Yellowish-white leaves remain on trees.	Liquid Lime Sulfur plus Zineb 65%	 1½ lb. per 100 gallon.	A single application of liquid lime sulfur as a dormant spray, coat buds and twigs thoroughly. Spray 2-3 times just as leaves start to unfurl. Spray at 7-10 day intervals and use a spreader sticker.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Orchids	Black Rot	Black areas on leaves and psedudo bulbs.	Natriphene	1:2000	Follow label directions. Soak plant and pot for 1 hour.
Pansy	Leafspot, Anthracnose	White to tan spots on leaves.	Maneb 80 W.P. or Zineb 75 W.P.	2 lbs. per 100 gallons	
	Wilt and Root Rot	Plant wilt. Roots black and discolored.	See Remarks		See Soil Sterilization and Damping-off Drenches.
Pachysandra	Leaf and stem Blight	Blight of leaves and stems.	Captan 50 W.P. or Ferbam 76 W.P.	2 lbs. per 100 gallons 2 lbs. per 100 gallons	At first sign spray 2-3 times at 7-10 day intervals. Then as needed.
Peony	Botrytis Blight	When young leafy shoots are about one foot long they wilt suddenly and fall over. Small flower buds turn black and wither. Opened flowers turn brown and are later covered by a gray mold.	Bordeaux Mixture or Ferbam or Zineb	8-8-100 2 lbs. per 100 gallons 2 lbs. per 100 gallons	Use either chemical as follows: When leaves a 1 foot high and at 14-21 day intervals. 1. As necessary. 2. Remove young infested shoots and burn. 3. Drench soil with treating solution.
	Leafspots	Spots of varying colors and sizes caused by several fungi.	Zineb or Captan	1 lb. per 100 gallons 2 lbs. per 100 gallons	Apply at 10-14 day intervals during dearly growing season or as needed.
Petunia	Botrytis Blight	Spots occurring on foliage with gray mold.	Zineb 75 W.P.	2 lbs. per 100 gallons	Spray during bloom every 7-10 days or as needed.
	Nematodes	Plants stunted, roots may be knotted or very poorly developed or both.	Nemagon or Fumazone	According to mfg's label.	Treat at, or before planting time. See section on Antibiotics, etc. for table of rates for small areas.

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Philodrendron	Bacterial Leafspot	Leaves blight	Streptomycin	100 ppm	Remove decayed leaves. Spray 2-3 times at 5-7 day intervals. Then spray as necessary.
	Phytophthora Leafspot	Black areas on leaves	Zineb 75 W.P.	1½ lbs. per 100 gallons	Spray at 5-7 day intervals as needed.
Phlox	Leafspot	Dead spots on leaves.	Ferbam 76 W.P.	2 lbs. per 100 gallons	Spray at 7-10 day intervals as needed.
	Powdery Mildew	White powdery fungus growth on leaf surface.	Karathane	2/3 Tbs. per gallon	Spray every 14-21 days as needed.
Photinia	Powdery	Young twigs distorted and stunted with white powdery fungus growth on surface of leaves.	As for Phlox		
	Leaf Spot	Brown spots on leaves causing early leaf fall.	Ferbam	1½ lbs. per 100 gallons.	Spray every 10-14 days as needed.
Pines	Fusiform Rust	Spindle shaped swelling on trucnks or branches	See Remarks		1. Cull trees before planting. 2. Prune limbs that are infected. 3. Cut and utilize trees with rust cankers in the trunk. 4. On sites with high fusiform rust hazard, plant longleaf or shortleaf pines rather than slash or loblolly if possible.
	Tip Blight Needle Cast	Leaves turn brown and die. Spots along on the needles.	Bordeaux	8-8-100	Spray 2-3 times as young needles come out at 7-10 day intervals. Then as needed.
	Longleaf Brown Spot	Brown spots occur on needles which girdle them and the outer ends die. Young trees often killed. Older saplings stunted.	See Remarks		If young tree is valuable, spray repeatedly with Bord Bordeaux mixture (8-8-100) at 14-21 day intervals.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Red Cedar	See Juniper				
Rhododrendron	Leafspots	Brown to dark leafspots on leaves.	Zineb 75 W.P. or Ferbam 76 W.P.	1½ lbs. per 100 gallons 2 lbs. per 100 gallons.	Spray with either 2-3 times at first sign at 7-10 day interval Then as needed.
	Dieback	Twigs dying back	Bordeaux	8-8-100	Prune out all affected parts. Spray 2-3 times at 10-14 day intervals then as needed.
	Powdery Mildew	Whitish powder on leaves.	Wettable Sulfur	2 lbs. per 100 gallons	Spray 2-3 times at 7-10 day intervals as needed.
Rose	Black Spot	Black spots on leaves with feathered edges. Leaves yellow, die and fall off.	Phaltan 50-W	1½ lbs. per 100 gallons	Spray every 7 days and every 4 days during rainy periods.
Note: Make a dormant spray of liquid lime sulfur using 5 tablespoons per gallon of water	Powdery Mildew	White mold on leaves, buds and flowers distorted and do not open properly.	As for Black Spot		As for Black Spot.
each year.Spray when weather is on warming trend and above 40°F.	Die Back and Stem Cankers.	Cankers form on branches or main stems and entire limbs die.	See Remarks		Remove affected portions as soon as possible. Above sprays will help prevent re-infections
Spray rose bushes and ground thr roughly.	Crown Gall	Large warty galls formed at ground level or on the roots.	See Remarks		Inspect plants before planting and dstroy plants with gall. If soil infested, move to new area, or fumiage with methyl bromide, 2 lbs. per 100 sq. ft. prior to planting.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Pines	Little Leaf	Found on short leaf throughout Piedmont. Attacks trees 20 years or older. Needles are short and yellow. Trees die in a few years after attack.	See Remarks		No control at present. Salvage infected timber. in making cuttings on these sites, save more resistant loblolly pines.
Planetree (See Sycamore)					
Poinsetta	Pythium Root Rot Rhizoctonia Root Rot	Roots brown to black. Lower leaves turning yellow and falling.	Dexon 35 W.P. Plus Terraclor 75 W.P.	8 oz. per 100 gallons Plus 4 oz. per 100 gallons	Apply ½ pint per 6 inch pot. Repeat in 7-10 days if needed
Poplar	Shoot Blight, Scab	Brown to dark dead areas on leaves. Shoots and twigs die.	Bordeaux	8-8-100	2-3 applications at 7-10 day intervals, as needed.
Primula (Primrose)	Chlorosis	Leaves turning yellow.	Magnesium	½ lb. per bushel of potting soil	A deficiency disease.
Pyracantha	Fireblight	Dieback of branches	See Remarks		Prune well below last visibl symptom and burn the affected parts.
	Scab	Dark spots on fruits.	Dodine (Cyprex)	½ to 3/4 lbs. per 100 gal.	Spray at 8-10 day intervals beginning before bloom and going through petal fall anc at least one application beyond petal fall.
Quince (Flowering)	Fireblight	Dead twigs, flower clusters.	Streptomycin	100 ppm	2-3 sprays during bloom at 4-5 day intervals. Prune out dead limbs and twigs as soor as they occur.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remar
Ryegrass	Cotton Blight	Damping-off of ryegrass seedlings, showing pronounced growth of white aeria mycelium from which the name is chosen.	Dexon 35 W.P.	8 oz. per 100 gallons	1. Wait until onset of coo weather before seeding for golf greens. 2. Begin spray at first si of disease and maintain a 10-14 day schedule according to weather.
	Helminthosporium leaf-spots and Turf spots	Irregular spots on leaves with no definite borders. leaves wither in dense turf, resulting in numerous, small, circular, dead areas, exposing the bare ground.			Spray with mercury - co taining fungicides.
	Brown patch	Brown scaled areas of turf (primarily of seedlings).			1. Delay seeding until onset of cool weather. 2. Spray turf with mercury-containing fungicides.
	Rust	Orange spots on leaves; leaves eventually wither and die.			Resistant varieties are being developed.
Sedum	Crown Rot Stem Rot	Plants decay at soil line.	See Remarks		1. Set plants in soil clean 2. Fumigate old soil, prior to planting with methyl bromide, 2 lbs. per 100 sq. ft.
Snapdragon	Anthracnose	Sunken spots on stems yellowish-green to gray with narrow brown border.	Captan or Ferbam 76%	2 lbs. per 100 gallons 1½ lbs. 100 gallons.	Spray every 7-10 days as needed. Spray every 7-10 days as needed.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Snapdragon	Botrytis	Wilting of flower spikes. Light brown areas on stems at base of flowers.	Zineb 75 W.P.	1½ lb. per 100 gals.	At first sign spray 3-4 time at 5-7 day intervals. Then as needed.
	Phyllosticta	Circular cream colored to light brown spots on leaves frequently the margins are another color.	Zineb or Captan or Maneb 80%	1 lb. per 100 gallons. 2 lbs. per 100 gallons 1½ lbs. per 100 gallons.	Spray every 7-14 days as needed. NOTE: Clean up all parts of old plants in fall and burn.
	Powdery Mildew	Gray powder on leaves.	Karathane	4 oz. per 100 gallons (⅓ tsp. per gal.)plus spreader sticker.	At first sign spray 2 times at 5-7 day intervals. Then as needed.
	Rhizoctonia Stem Rot	Stems rotting at ground level.	Terraclor 75 W.P.	1 lb. per 100 gals.	Drench 1 pint per sq. ft.
	Rust	Brown pustules on lower surface. Leaves dying.	Zineb	1½ lbs.per 100 gals.	Spray every 7-10 days as necessary.
	Sclerotinia Rot, and Verticillium Wilt.	Plants wilt and die.	See remarks		See Soil Sterilization.
Snowberry	Anthracnose, Berry Rot, Spot Anthracnose	Spots on berries and leaves	Captan 50 W.P.	2 lbs. per 100 gallons	Spray Schedule: 1. When flowers first open. 2. At petal fall. 3. Four weeks later. 4. Four weeks later
Staghorn Sumac	Powdery Mildew	White powder on leaves	Wettable Sulfur	2 lbs. per 100 gals.	2-3 applications at first sign 5-7 days apart. Then as needed.

DISEASES OF ORNAMENTALS (Cont'd.)

Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Tulip	Breaking	Stripes or irregular spotting of solid colored flowers, plants stunted, leaves mottled.	See Remarks		1. Remove infected plants and burn. 2. Control aphids as they spread this virus disease.
Turf (See Lawn Grasses)					
Viburnum	Bacterial Leafspot	Brown dead spots on leaves.	Bordeaux	8-8-100	2-3 sprays at 7-10 day intervals as necessary.
	Powdery Mildew	Grayish powder on leaves.	Karathane	8 oz. per 100 gallons	Spray 2 times at 5-7 day intervals as necessary to control.
Violet	Scab	Elongate to circular spots to ¼ inch at their widest. These spots may be yellowish-brown; rose-colored or whitish.	Maneb 80 W.P. or Zineb 75 W.P.	1½ lbs. per 100 gallons 1 to 1½ lbs. per 100 gals.	Begin at first sign and thereafter at 10-14 day intervals as necessary.
Virginia Creeper	See Boston Ivy				
Walnut-Black	Anthracnose	Black dead spots on the leaves.	Dodine 65 W.P. or Zineb 75 W.P.	1 lb. per 100 gallons 2 lbs. per 100 gallons	Spray 3-4 times a first sign at 14-21 day intervals.
Willow	Scab, Blight Canker	Leaves turn brown and wilt, cankers appear on twigs.	See Dormant Spray Maneb or Zineb	1½ lbs. per 100 gallons	Dormant spray of liquid lime sulfur and after new leaves are out. Spray 2-3 times at 14-21 day intervals.
Wood Rots Benches and posts.			Copper or Zinc Naphtenate	See Remarks	As recommended by manufacturer. Fumes from carrier may cause injury to some plants.

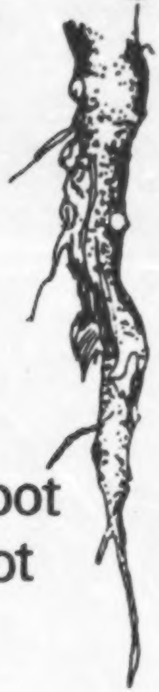
DISEASES OF ORNAMENTALS (Cont'd.)

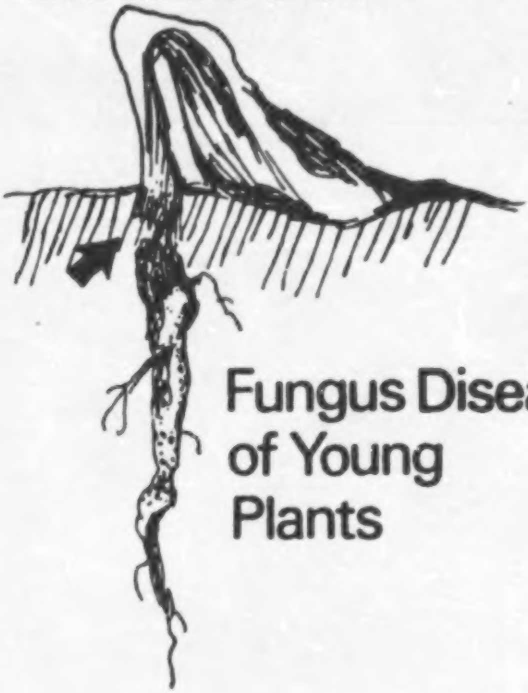
Plant	Disease	Symptom	Material	Rate	Recommendations & Remarks
Stocks	Bacterial blight		See Remarks		Buy certified treated seed Soil Sterilization - see.
	Root Rot, Wire Stem, Damping-off	Plants damp-off at ground line	Terraclor 75 W.P. plus Captan 50 W.P.	8 oz. per 100 gals. 8 oz. per 100 gals.	Drench soil 1 pint per sq. ft.
Spruce	Cytospora Canker	Browning and death of branches - usually starting near ground and working upward.	Bordeaux	8-8-100	At first sign 2-3 applications at 10-14 day intervals. Thereafter as needed
Sweet Pea	Powdery Mildew	Leaves and entire plants dying, white mold on surface	Karathane	2/3 Tbs. per gallon	Every 2 weeks as needed. NOTE: Do not use when temperature is above 80°F.
	Root and Stem Rot	Plants turning yellow and dying.	Formaldehyde or	1 part to 49 parts water.	Drench soil thoroughly, well in advance of planting.
			Methyl Bromide	2 lbs.per 100 Sq. ft.	As per manufacturer's label.
Sycamore (Planetree)	Anthracnose	Light brown dead areas appear on leaves frequently near veins. Enlarge to include whole leaf.			
	Powdery Mildew	Gray powder on leaves.	Wettable Sulfur	2 lbs. per 100 gals.	2-3 sprays as needed at 7-10 day intervals.
Trumpet Vine	Powdery Mildew	Gray powder on leaves.	Wettable Sulfur	2 lbs. per 100 gals.	Spray 2-3 times at 7-10 day intervals as necessary.
Tulip	Botrytis Blight (Tulip Fire)	Leaves flected with small brown spots becoming large with light gray centers and brown margins.	Ferbam 76 W.P.	1½ to 2 lbs. per 100 gal.	Start sprays when foliage is 2-4 inches tall; spray at 7-10 day intervals, 4 successive applications should be enough.
	Bulb Rot	See Hyacinth			

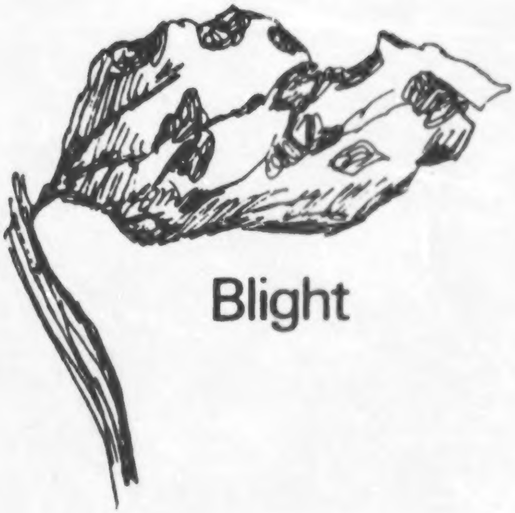
DISEASES OF ORNAMENTALS (Cont'd.)

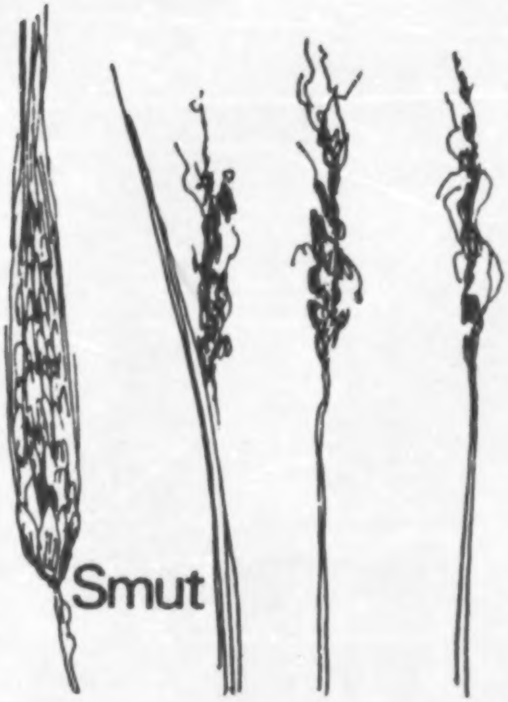
Plant	Disease	Symptom	Material	Rate	Recommendations and Remarks
Zinnia	Powdery Mildew	White mold on leaves.	Wettable Sulfur or	4 lbs. per 100 gallons	Thorough coverage of plants as needed.
			Karathane (Mildex)	2/3 Tbs. per gallon	Every two weeks as necessary.
	Alternaria Leaf and Flower Blight	Reddish-brown spots with grayish centers on leaves. Dark brown cankers also occur on stems.	Bichloride of Mercury and	1 oz. to 7½ gallons	Treat seed 5 to 10 minutes and rinse thoroughly.
			Ferbam 76% or	1½ lbs. per 100 gallons	Spray every 10-14 days during season as needed for protection.
			Bordeaux Mixture	8-8-100	Same as for Ferbam above.

Fungus Diseases

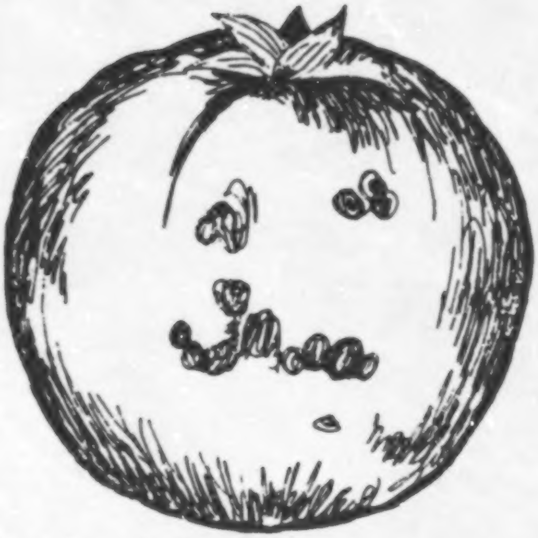



Fungus Disease
of Young
Plants

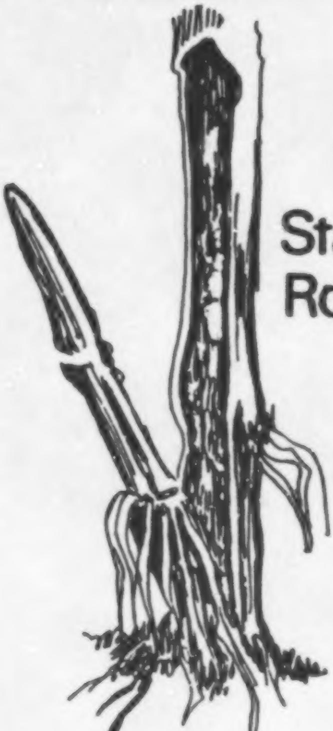




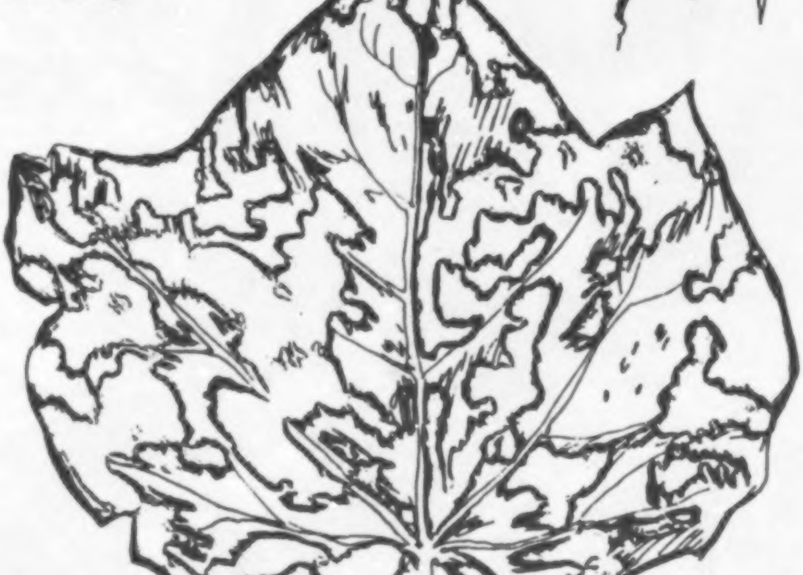
Bacterial Diseases



Bacterial Spot on Tomato

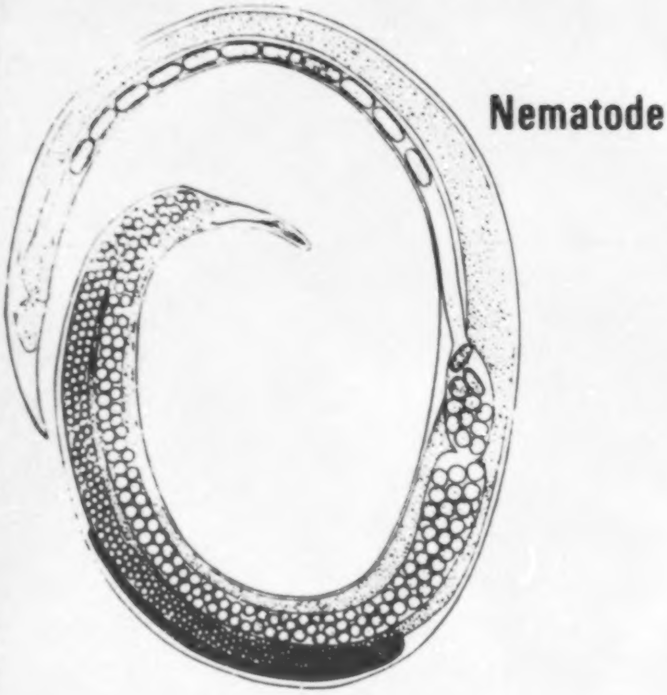


Stalk Rot

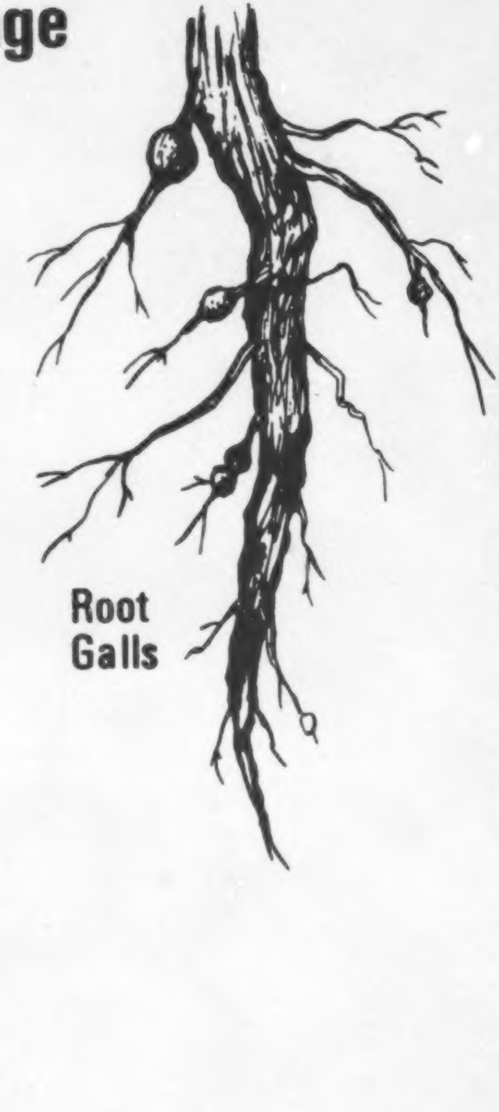


Cotton Leaf Blight

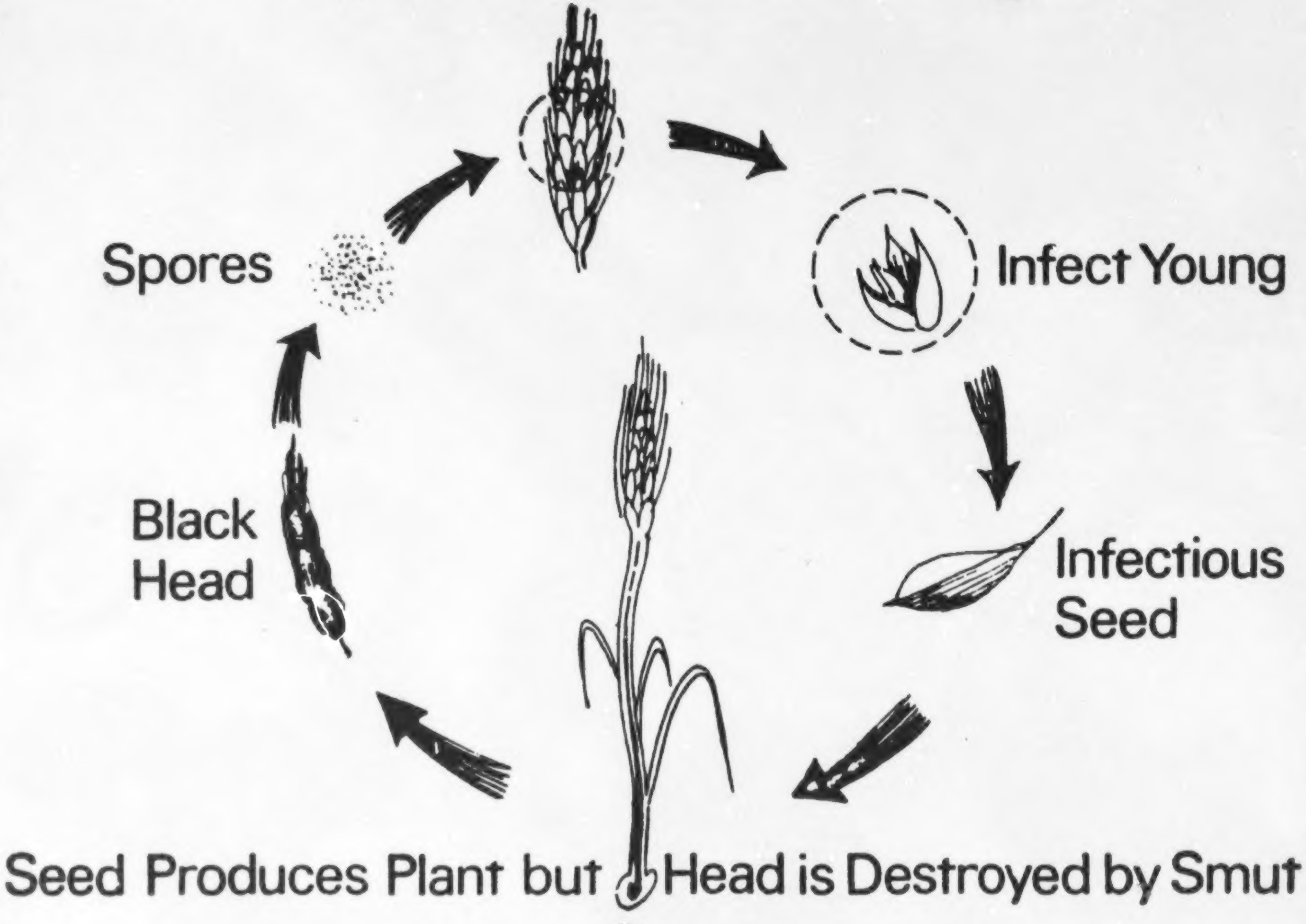
Nematode Damage



Actual Length Equals 1/50 to 1/25 Inch



Life Cycle of Smuts (Fungus)



Infect Young

Infectious Seed

Seed Produces Plant but Head is Destroyed by Smut

Black Head

Spores

PLANT DISEASES

ASSIGNMENT SHEET #1 - COLLECTING DISEASED PLANTS

Have student collect ten plants that show evidence of disease damage and tell what disease it is.

PLANT	DISEASE
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

PLANT DISEASES

ANSWERS TO ASSIGNMENT SHEET

Assignment sheet #1

To the satisfaction of the instructor.

OH - 119-C

PLANT DISEASES

TEST

I. Match the terms below to the correct definition.

___A. Fungi

___B. Nematode

___C. Saprophytes

___D. Bacteria

___E. Parasite

1. Tiny, thread-like plants.
2. Single celled organism.
3. Small worm-like organisms that suck plant juices from plant cells.
4. Fungi that obtains food from living plants.
5. Fungi that obtains food from dead plants.

II. Name the three main causes of plant diseases.

A.

B.

C.

III. List the two types of plant diseases.

A.

B.

IV. List three pathogenic diseases.

A.

B.

C.

V. Describe non-pathogenic diseases.

VI. List two facts about bacteria.

A.

B.

VII. List four diseases caused by bacteria.

A.

B.

C.

D.

VIII. List six characteristics of disease bacteria.

A.

B.

C.

D.

E.

F.

IX. List three facts about fungi.

A.

B.

C.

X. List two characteristics of fungi.

A.

B.

XI. List three facts about viruses.

A.

B.

C.

XII. Describe four characteristics of viral diseases.

A.

B.

C.

D.

XIII. List ten plant diseases.

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

PLANT DISEASES

ANSWERS TO TEST

I. A. 1

B. 3

C. 5

D. 2

E. 4

II. A. Fungi

B. Bacteria

C. Viruses

III. A. Pathogenic

B. Nonogenic

IV. A. Bacterial

B. Viral

C. Fungal

V. Should contain the following information:

A. Disease that arises from causes other than living disease causing organisms.

B. Not always considered a disease.

VI. A. One celled plants that increase by division.

B. Obtain their food from living or dead organic material.

VII. A. Soft rot

B. Leaf spot

C. Gall

D. Wilt

SECTION D

UNIT I

CUTTINGS

PLANT PROPAGATION - CUTTINGS

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to produce new plants from various types of cuttings and prepare propagation beds. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with cuttings to the correct definition.

II. List three major types of cuttings.

III. Demonstrate the three major types of cuttings as shown by instructor.

IV. Discuss the importance of cuttings in a short paragraph.

V. List three factors that affect success of root cutting.

VI. Demonstrate how to take a leaf bud cutting.

VII. List three steps for preparation of cuttings.

VIII. Adequately place plants in a rooting bed for preparation.

IX. Discuss environmental conditions for plant propagation.

PLANT PROPAGATION - CUTTINGS

SUGGESTED ACTIVITIES

I. Instructor:

   A. Provide students with objective sheet.

   B. Provide students with information and assignment sheets.

   C. Make transparencies.

   D. Discuss terminal and specific objectives.

   E. Discuss information and assignment sheets.

   F. Direct student through the different learning paths for each specific objective.

   G. Give test.

II. Student:

   A. Read objectives.

   B. Study information sheets.

   C. Complete each assignment sheet.

   D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objectives

   B. Information sheets

   C. Transparency masters

      1. TM 1 - Stem Cutting

      2. TM 2 - Heel or Mallet Cutting

      3. TM 3 - Leaf Cutting

      4. TM 4 - Whole Leaf Cutting

   5. TM 5 - Leaf Stem Cutting
   6. TM 6 - Leaf Bud Cutting
   7. TM 7 - Root Cutting

D. Assignment sheets

   1. Assignment sheet #1 - Prepare Leaf Bud Cutting
   2. Assignment sheet #2 - Prepare Two Stem Cutting
   3. Assignment sheet #3 - Prepare Two Leaf Cutting
   4. Assignment sheet #4 - Prepare Two Root Cutting
   5. Assignment sheet #5 - True and False Questionnaire

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Edmond, Senn and Andrews, Fundamentals of Horticulture, New York, New York, McGraw Hill Inc., 1964

B. Plant Propagation, Cooperative Extension Service, University of Arkansas Division of Agriculture, U.S. Department of Agriculture, Cooperating, Leaflet 276

C. Propagating Horticulture Plants, Module No. 3, Ohio State University.

D. Stuckey, H.P., Southern Horticulture, Atlanta, Georgia, Smith and Co., 1944.

III. Additional Teaching Materials

A. Pruning Knife

B. Pruning Shears

C. Vermiculite

D. Rooting Trap

E. Parent Plants

PLANT PROPAGATION - CUTTINGS

INFORMATION SHEET

I. Terms and definitions:

A. STEM CUTTING - Made by cutting a segment of a growing limb or shoot from the parent plant, usually six to eight inches in length. Usually current growth or one year old wood.

B. LEAF CUTTING - Either a whole leaf or section of a leaf from certain plants which will send forth new shoots and roots.

C. LEAF BUD CUTTING - Usually consists of a part of the stem with the auxilliary bud, petiole and parts of the leaf of certain thick fleshy-leaf plants which root and send forth shoots.

D. ROOT CUTTING - Pieces of roots usually two to six inches in length and about the diameter of a pencil which when planted will send forth shoots from adventitious buds, thus producing new plants.

E. HARDWOOD CUTTINGS - Usually made in the winter months from plants and trees which shed their leaves.

F. SEMI-HARDWOOD CUTTINGS - Usually made from evergreen plants and are cut from newer growth on the plants after it has finished the rapid summer growth.

G. SOFTWOOD CUTTINGS - Are made from new growth in the spring or early summer while that part of the plant is growing rapidly.

H. HERBACEOUS CUTTINGS - Are made from plant materials which are soft, rapid growing and relatively high in water content.

I. CALLUS - Protective covering formed over the cut or wounded surface of a plant.

J. HERBACEOUS - Green succulent plants such as flowering plants.

K. WOUNDING - Process of removing bark from the stem by several means. (Strip lower branches from stem, cut segments of bark from base of stem or by making several cuts through the bark at the base of stem.)

L. ROOTING COMPOUNDS - Products on the market which promote root growth from the stem of plants.

INFORMATION SHEET

M. HUMIDITY - Amount of moisture in the air.

N. ROOTING MEDIA - Soil substances in which plants are rooted.

II. Three major types of cuttings:

A. Stem cuttings

1. Hardwood cutting

2. Semi-hardwood cutting

3. Soft wood cutting

4. Herbaceous cutting

B. Leaf cutting

1. Leaf bud cutting

C. Root cutting

III. Procedure for the major types of cuttings:

A. Stem cuttings

1. Select healthy plants

2. Make cuttings at right times of year.

3. Cuttings should be three to eight inches in length with three or more buds or leaves per cutting.

4. Use sharp cutting tools to prevent damage to plant.

5. Cut stems flat on top and slanted at the bottom.

6. Some plants root better where older wood is included; heel or mallet cutting provide for this.

B. Leaf cutting

1. Select healthy plants.

2. Remove a large well matured leaf.

3. New plant will arise from base of the leaf stem.

INFORMATION SHEET

4. Or new plant will arise from base of the leaf stem.

5. In the case of a leaf tissue cutting,the leaf is placed flat on media and weighted down.

6. In the case of leaf stem cutting, the stem is inserted into the media.

C. Root Cutting

1. Select healthy plants.

2. Dig soil away from the roots, to get to the root to be cut.

3. Cut root from parent plants.

4. Roots ¼ to ½ inch diameter are most desirable.

5. Cut the roots into sections two to six inches long.

6. Cut the top of the cutting flat and the bottom at an angle.

7. Take cutting in late winter or early spring (aviod taking them in spring when plant is making its new growth.)

8. Plant cutting so that the top is level with top of soil.

9. When planting grafted or budded plants the root cuttings will only produce the bottom part of the plant.

IV. The importance of cuttings.

A. Is cheaper.

B. Faster than using seeds, budding or grafting.

C. Helps maintain characteristics on the original plants.

D. Are easier to make than budding or grafting.

V. Factors that affect success of root cuttings.

A. Time cuttings are made.

B. Age of parent plant.

INFORMATION SHEET

   C. Media

VI. How to take a leaf bud cutting.

   A. Select healthy plants.

   B. Select stems with well developed buds.

   C. Cut a two to three inch section with a mature leaf and bud.

   D. Use sharp cutting tools.

   E. Place in media.

VII. Preparation of cuttings.

   A. Callusing

   B. Wounding

   C. Rooting compounds

VIII. Placing plants in a rooting bed.

   A. Preparation of bed:

      1. Prepare bed several days before placing plants in it.

      2. Use trays that permit drainage.

      3. Use commercially prepared rooting mediums or mix medium using sand, vermiculite, peat moss, etc.

   B. Depth of bed:

      1. Should be deep enough to put plants ½ their total length and still allow an inch of space in the bottom.

   C. Procedure for planting the cuttings:

      1. Lay flat board on the bed. This board should be same width of bed and about three inches wide.

      2. Use a thick blade object to make a deep cut in the media along one edge of the board.

INFORMATION SHEET

3. Place cutting in the cut with at least one half of their length below top of cut.

4. Space cutting so that the leaves just touch or allow just a small amount of room between cuttings with no leaves.

5. Press the flat board against the open so the media is against the cuttings.

6. Move the board to the other side of the row and repeat the operation.

7. After all cuttings are in place, carefully flood the bed to settle media around the cutting.

8. Future watering should be a fine misting.

IX. Environmental conditions for plant propagation.

  A. Heat

    1. Temperature should be kept between 70 and 80 degrees in day and 60 to 70 degrees at night.

  B. Light

    1. Cuttings with leaves left on should be exposed to good light.

    2. Some plants root better when held in darkness for a while.

  C. Humidity

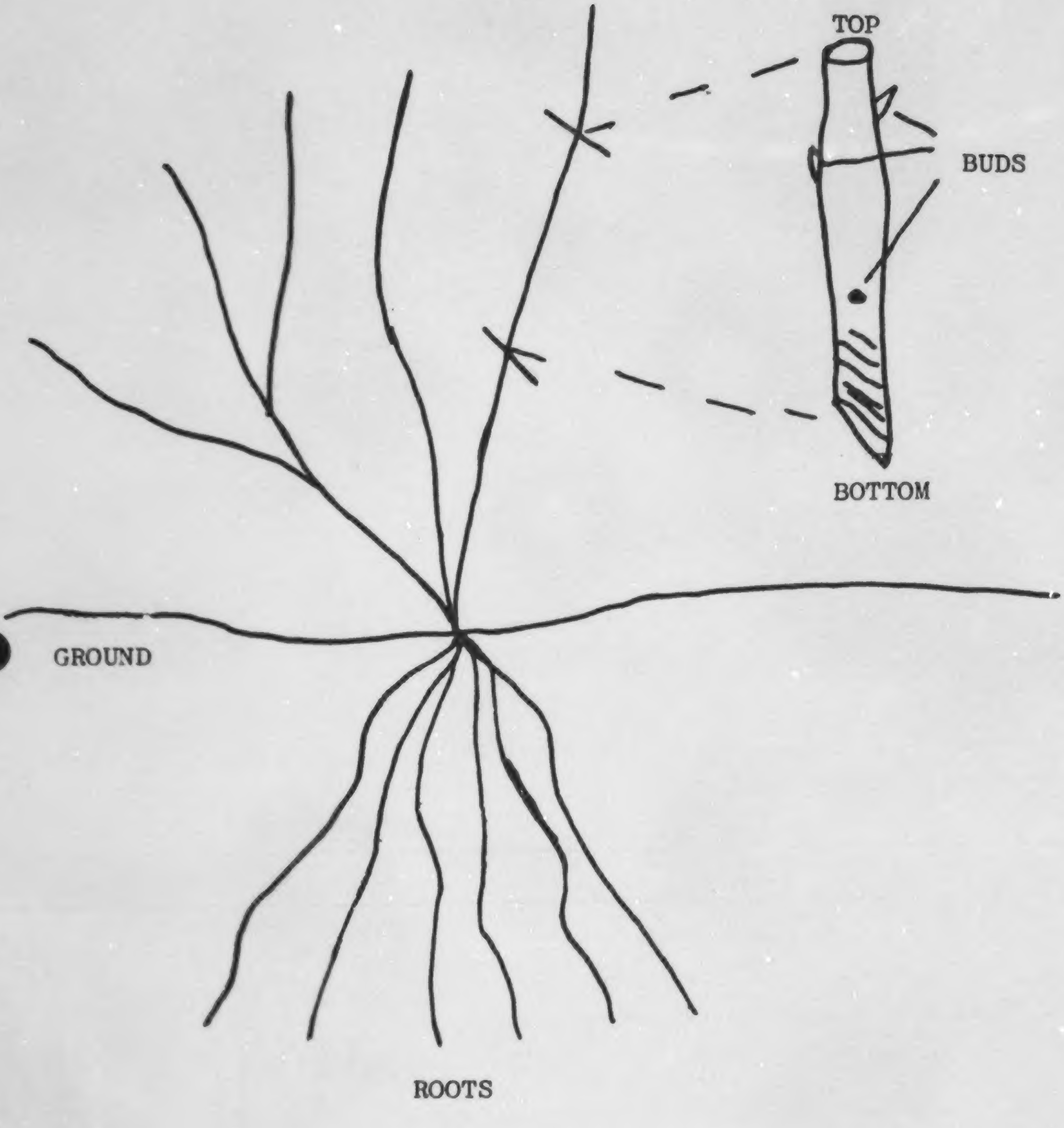
    1. Is very much affected by the temperature.

    2. Many plants will root only under humid conditions.

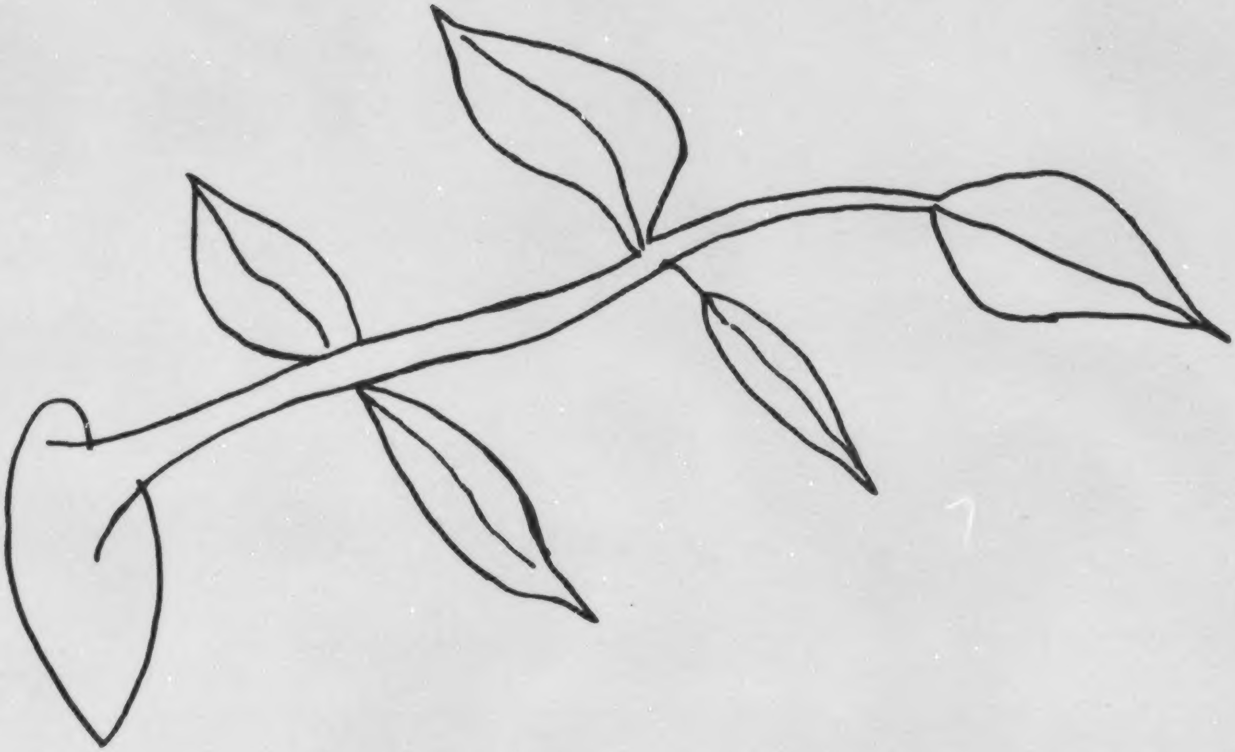
    3. Add misting system if humidity isn't high enough.

  D. Proper balance of heat, light and humidity is very important.

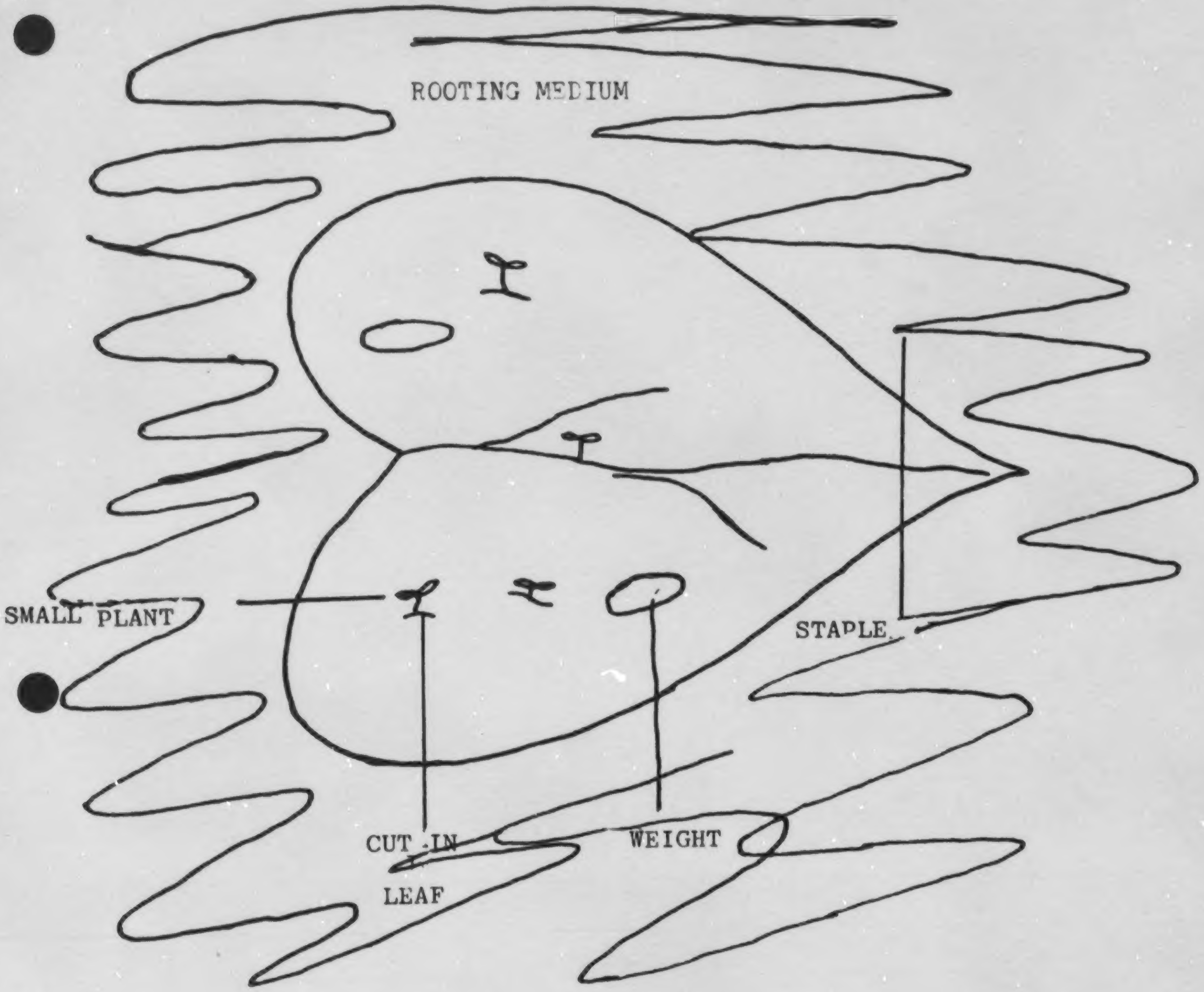
STEM CUTTINGS


TOP
BUDS
BOTTOM
GROUND
ROOTS

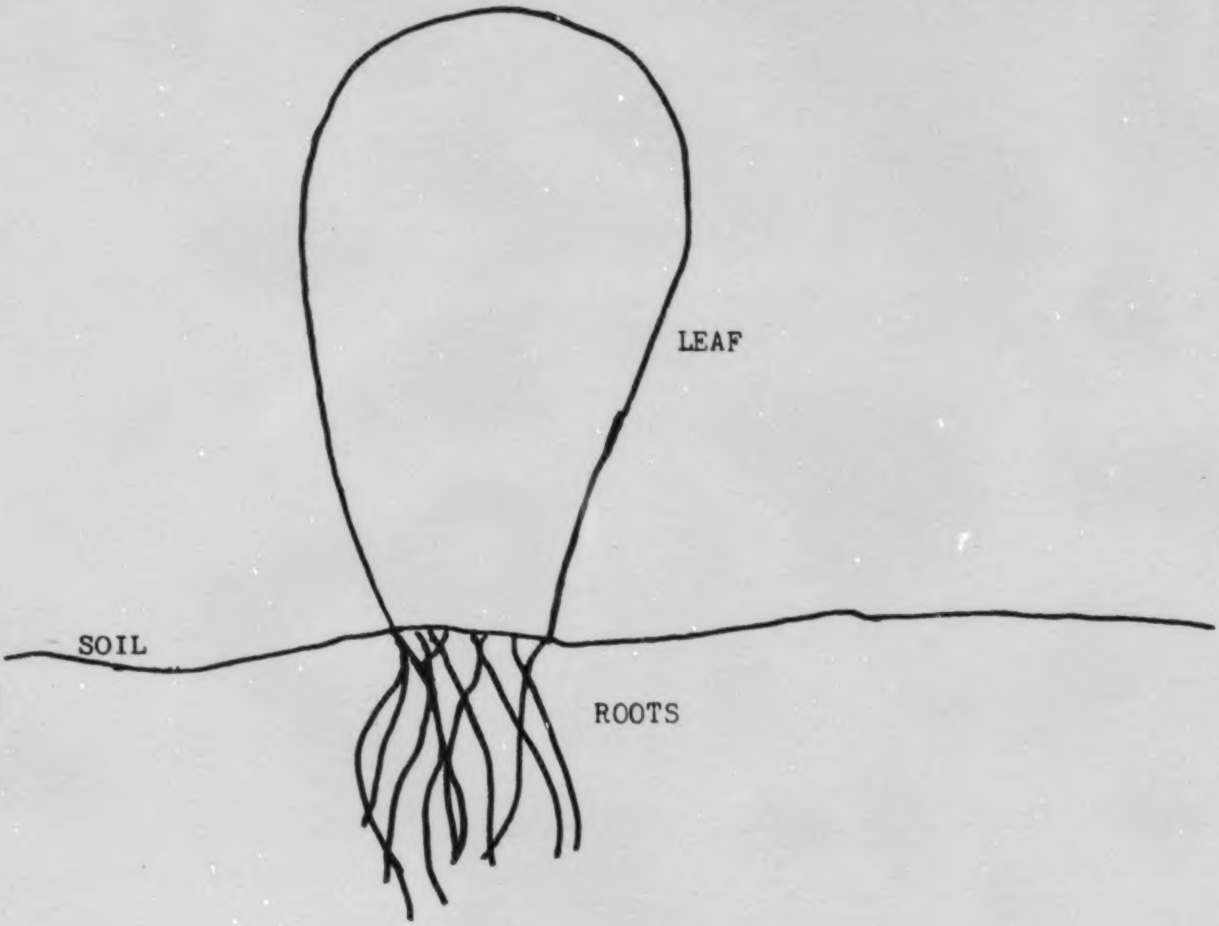
HEEL OR MALLET CUTTING



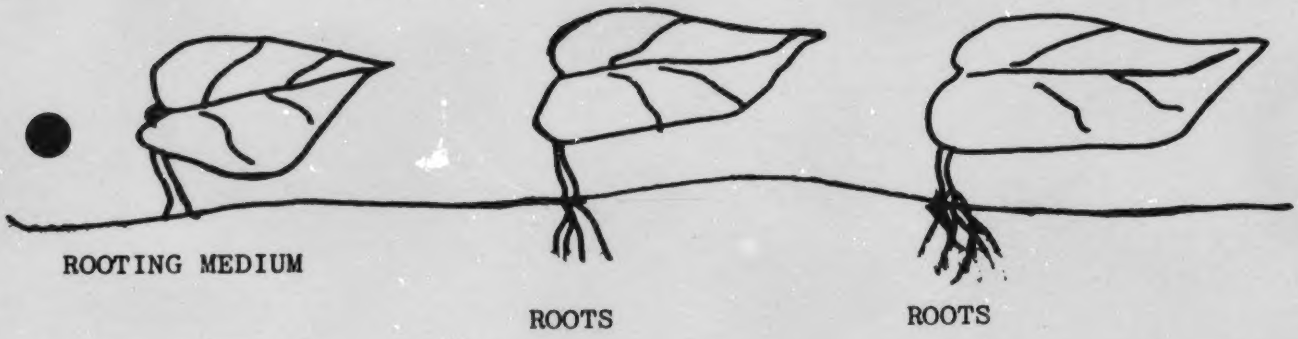
LEAF CUTTING


ROOTING MEDIUM
SMALL PLANT
STAPLE
CUT IN LEAF
WEIGHT

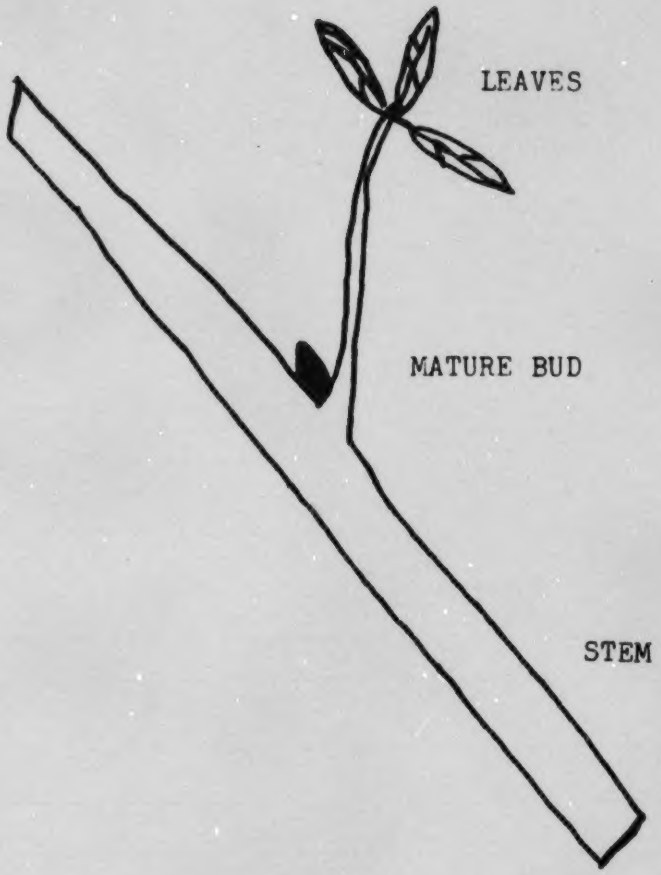
WHOLE LEAF CUTTING


LEAF
SOIL
ROOTS

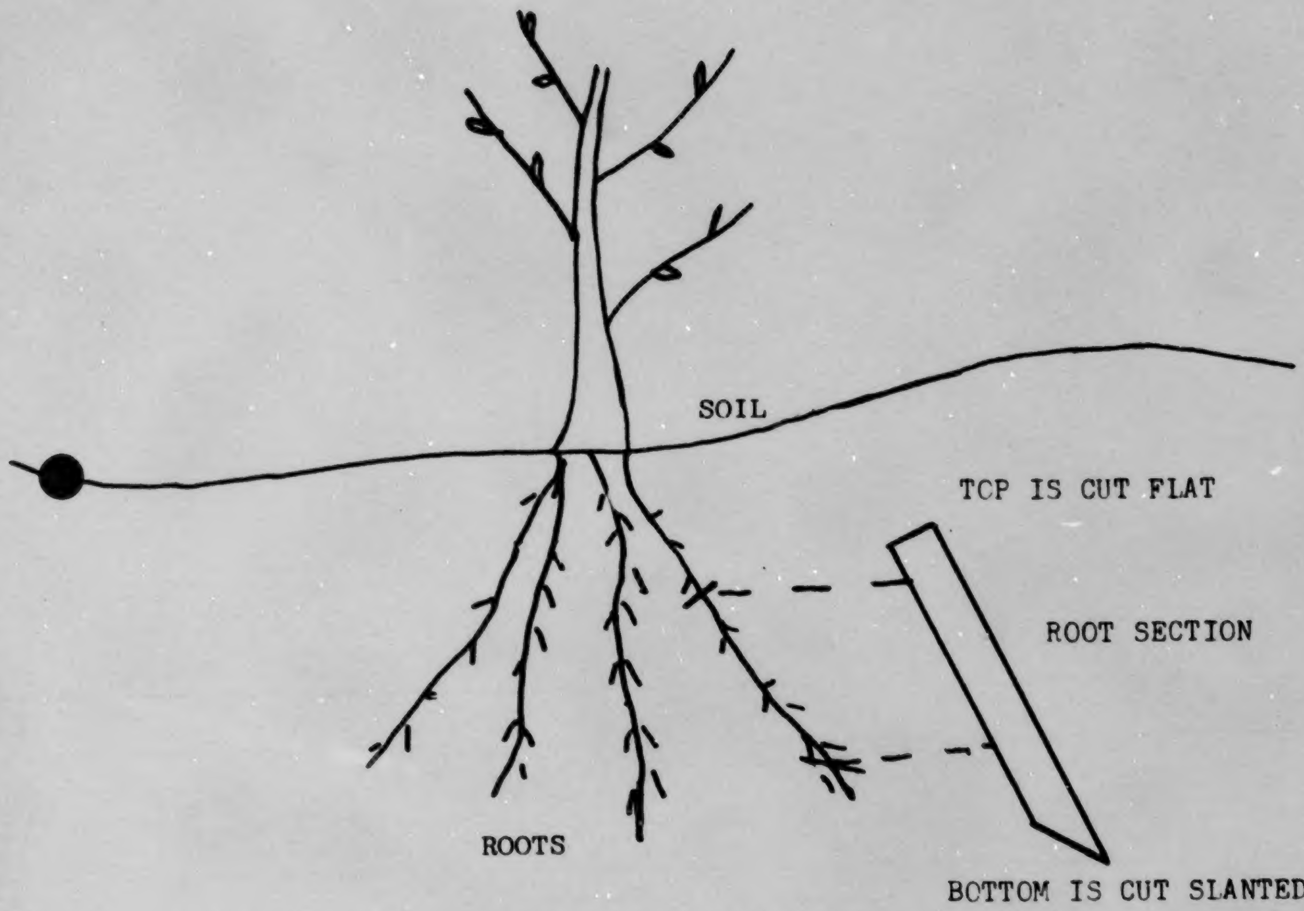
LEAF STEM CUTTING


ROOTING MEDIUM
ROOTS
ROOTS

LEAF BUD CUTTING


LEAVES
MATURE BUD
STEM

ROOT CUTTING


SOIL
TOP IS CUT FLAT
ROOT SECTION
ROOTS
BOTTOM IS CUT SLANTED

PLANT PROPAGATION - CUTTINGS

ASSIGNMENT SHEET #1 - PREPARE TWO LEAF BUD CUTTINGS

Directions: The student will go to the greenhouse where there are plant limbs from which the student will prepare two leaf bud cuttings.

PLANT PROPAGATION - CUTTINGS

ASSIGNMENT SHEET #2 - PREPARE TWO STEM CUTTINGS

Directions: The student will go the the greenhouse and prepare a tray of stem cuttings from a parent plant provided by the instructor.

PLANT PROPAGATION - CUTTINGS

ASSIGNMENT SHEET #3 - PREPARE TWO LEAF CUTTINGS

Directions: The student will go the the greenhouse and prepare the two types of leaf cuttings as demonstrated by the instructor.

PLANT PROPAGATION - CUTTINGS

ASSIGNMENT SHEET #4 - PREPARE TWO ROOT CUTTINGS

Directions: The student will go to the greenhouse, prepare two root cuttings and plant them.

PLANT PROPAGATION - CUTTINGS

ASSIGNMENT SHEET #5 - TRUE AND FALSE QUESTIONNAIRE

Directions: Mark each statement true or false.

1. ________ Producing plants from cuttings is cheaper than using seeds, budding and grafting.

2. ________ Many types of plants will not produce the same quality or type of plants from seeds.

3. ________ Commercial plant producers use seeds to produce a large number of plants faster than by using cuttings.

4. ________ It does not matter whether your cutting tools are sharp or not when taking cuttings.

5. ________ It makes no difference if the plant is healthy or not when taking cuttings.

6. ________ It makes no difference what time of the year you take root cuttings.

7. ________ Rooting compounds promote leaf growth.

8. ________ Misting systems in greenhouses increase the humidity.

PLANT PROPAGATION - CUTTING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

Assignment sheet #2

To the satisfaction of the instructor.

Assignment sheet #3

To the satisfaction of the instructor.

Assignment sheet #4

To the satisfaction of the instructor.

Assignment sheet #5

1. True
2. True
3. False
4. False
5. False
6. False
7. False
8. True

PLANT PROPAGATION - CUTTINGS

TEST

I. Match the terms below to the correct definition.

___A. Pieces of roots usually two to six inches in length when planted will send forth shoots.

___B. Consist of a part of the stem with the auxilliary bud, petiole and parts of the leaf of certain thick fleshy-leaf plants which root and send forth shoots.

___C. Either a whole leaf or section of a leaf from certain plants which will send forth new shoots and roots.

___D. Usually made in the winter months from plants and trees which shed their leaves.

___E. Made by cutting a segment of a growing limb or shoot from the parent plant, usually six to eight inches in length, usually current growth or one year old wood.

1. Stem Cutting
2. Leaf Cutting
3. Leaf Bud Cutting
4. Root Cutting
5. Hardwood Cutting
6. Semi-hardwood Cutting
7. Softwood Cutting
8. Herbaceous Cutting
9. Callus
10. Herbaceous
11. Wounding
12. Rooting Compound
13. Humidity
14. Rooting Media

___F. Green succulent plants such as flowering plants.

___G. Protective covering formed over the cut or wounded surface of a plant.

___H. Are made from plant materials which are soft, rapid growing and relatively high in water content.

___I. Are made from new growth in the spring or early summer while that part of the plant is growing rapidly.

___J. Usually made from evergreen plants and are cut from newer growth in the plant after it has finished rapid summer growth.

___K. Soil substance in which plants are rooted.

L. Amount of moisture in the air.

M. Products on the market which promote root growth from the stem of plants.

N. Process of removing bark from the stem by several means.

II. List three major types of cuttings.

A.

B.

C.

III. Turn in to the instructor the results of assignment sheet 2,3 and 4.

IV. Discuss in a short paragraph, the importance of cutting.

V. List three factors that affect success of root cuttings.

A.

B.

C.

VI. Turn in to the instructor the results of assignment sheet #1.

VII. List three steps for preparation of cuttings.

A.

B.

C.

VIII. Go to the greenhouse and place plants in a rooting bed.

IX. Discuss environmental conditions for plant propagation to heat, light and humidity.

PLANT PROPAGATION - CUTTINGS

ANSWERS TO TEST

I. A. 4
   B. 3
   C. 2
   D. 5
   E. 1
   F. 10
   G. 9
   H. 8
   I. 7
   J. 6
   K. 14
   L. 13
   M. 12
   N. 11

II. A. Stem cuttings
    B. Leaf cuttings
    C. Root cuttings

III. To the satisfaction of the instructor.

IV. To the satisfaction of the instructor.

V. A. Time cuttings are made.
   B. Age of parent plant.
   C. Media

VI. To the satisfaction of the instructor.

VII. A. Callusing

B. Wounding

C. Rooting compounds

VIII. To the satisfaction of the instructor.

IX. To the satisfaction of the instructor.

SECTION D

UNIT II

LAYERING

PLANT PROPAGATION - LAYERING

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to produce plants from the six types of layering. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with layering to the correct definition.

II. List five facts about layering.

III. List six types of layering.

IV. List three things that root formation depends on.

V. List the various types of layerage and two plants produced by each type.

VI. List three factors that affect care of new plants.

PLANT PROPAGATION - LAYERING

SUGGESTED ACTIVITIES

I. Instructor:
   A. Provide students with objective sheet.
   B. Provide students with information and assignment sheets.
   C. Make transparencies.
   D. Discuss terminal and specific objectives.
   E. Discuss information and assignment sheets.
   G. Give test.

II. Student:
   A. Read objectives.
   B. Study information sheets.
   C. Complete each assignment sheet.
   D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:
   A. Objectives
   B. Information sheets
   C. Transparency masters
      1. TM 1 - Stimulating Rooting During Layering
      2. TM 2 - Simple Layering
      3. TM 3 - Tip Layering
      4. TM 4 - Compound Layering
      5. TM 5 - Air Layering

6. TM 6 - Mound Layering
7. TM 7 - Trench Layering

D. Assignment sheets

1. Assignment sheet #1 - Simple Layering
2. Assignment sheet #2 - Tip Layering
3. Assignment sheet #3 - Compound Layering
4. Assignment sheet #4 - Air Layering
5. Assignment sheet #5 - Mound Layering
6. Assignment sheet #6 - Trench Layering

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Hartmann, H.F. and D.E. Kester, Plant Propagation, New Jersey, Prentice Hall, Inc., 1975.

B. Propagating Horticulture Plants, Module No. 3, Ohio State University.

III. Additional teaching materials:

A. Spade
B. Trowel
C. Plastic
D. Foil
E. String
F. Rooting Hormone
G. Wire
H. Stakes

PLANT PROPAGATION - LAYERING

INFORMATION SHEET

I. Terms and definitions:

A. LAYERING - Technique of rooting shoots while they are still attached to parent plant.

B. TIP LAYERING - Covering tips of stems with moist soil.

C. SIMPLE LAYERING - Covering a stem just back of tip with moist soil.

D. AIR LAYERING - Stems of previous seasons growth is surrounded with peat moss and held in place by plastic.

E. MOUND LAYERING - Cutting back stems during the non-growing season and covering the young stem with mounds of soil.

F. TRENCH LAYERING - Consist of laying the basal and middle portions of young stems in a shallow trench or covering these sections with soil. Terminal portion is left exposed.

G. RUNNERS - A stem which develops from the axil of leaf at crown of a plant and forms a new plant at nodes.

H. CROWNS - Parts of plants stem below the surface of the ground from which new shoots emerge.

II. Five facts about layering.

A. Relative dependable method of inducing rooting.

B. Used on plants difficult to root by cuttage or grafting.

C. Used to propagate plants that do not come true from seeds.

D. Is expensive.

E. Not used to produce large quantities of plants.

III. Six types of layerage.

A. Tip

B. Simple

INFORMATION SHEET

- C. Compound or Serpentive
- D. Air
- E. Mound
- F. Trench

IV. Root formation depends on:

- A. Continuous moisture
- B. Good aeration
- C. Moderate temperatures

V. Examples of various types of layerage.

- A. Tip layerage
  - 1. Trailing blackberries
  - 2. Dewberries
  - 3. Blackberries
  - 4. Purple raspberries
  - 5. Boysenberry
- B. Air layerage
  - 1. Dogwood
  - 2. Magnolia
  - 3. Holly
  - 4. Camellia
  - 5. Azalea
  - 6. Rubber plants
  - 7. Schefflera
  - 8. Dracaena

INFORMATION SHEET

C. Simple layerage
    1. Dieffenbachia
    2. Ivy
    3. Philodendrons
    4. Strawberries

D. Compound layerage
    1. Muscadine grapes
    2. Wisteria
    3. Clematis

E. Mound layerage
    1. Clonal apple stocks
    2. Quince
    3. Currants
    4. Gooseberry

F. Trench layerage
    1. Azaleas

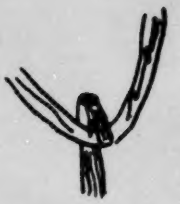
VI. Care of new plants.

A. These new plants will have a larger vegetative growth than the roots can support.

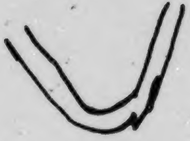
B. The root should be further developed before planting.

C. In some cases prune the tops back to a size the root can support.

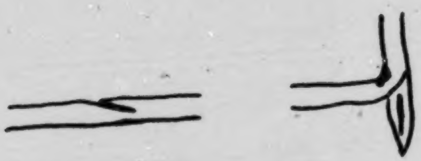
STIMULATING ROOTING DURING LAYERING



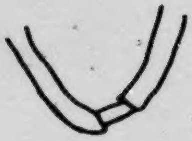
shoot is bent to a sharp "v"



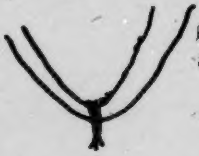
shoot is cut or broken on the lower side



cut shoot on upper side terminal end is then brought up



girdling the stems by removing the bark



girgling by wrapping copper wire around the stem

PLANT PROPAGATION - LAYERING

TEST

I. Match the terms below to the correct definition.

___A. Part of plant stem below the surface of the ground from which new shoots emerge.

___B. A stem which develops from the axil of leaf at crown of plant and forms a new plant at nodes.

___C. Consist of laying the basal and middle portions of young stems in a shallow trench or covering these sections with soil. Terminal portions is left exposed.

___D. Cutting back stems during the non-growing season and covering the young stem with mounds of soil.

___E. Stems of previous seasons growth is surrounded with peat moss and held in place by plastic.

___F. Covering a stem just back of tip with moist soil.

___G. Covering the tips of stems with moist soil.

___H. Technique of rooting shoots while they are still attached to parent plant.

1. Runners
2. Trench Layering
3. Layering
4. Crowns
5. Tip layering
6. Simple Layering
7. Air Layering
8. Mound Layering

II. List five facts about layering.

A.

B.

C.

D.

E.

III. List six types of layering.

A.

B.

C.

D.

E.

F.

IV. List three things that root formation depends on.

A.

B.

C.

V. List the various types of layerage and two plants produced by each type.

A.
1.
2.

B.
1.
2.

C.
1.
2.

D.
1.
2.

E.
1.
2.

F.
1.
2.

VI. List three factors that affect care of new plants.

A.

B.

C.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

I. A. 4

B. 1

C. 2

D. 8

E. 7

F. 6

G. 5

H. 3

II. A. Relative dependable method of inducing rooting.

B. Used on plants difficult to root by cuttage or grafting.

C. Used to propagate plants that do not come true from seeds.

D. Is expensive.

E. Not used to produce large quantities of plants.

III. A. Tip

B. Simple

C. Compound or Serpentive

D. Air

E. Mound

F. Trench

IV. A. Continuous moisture.

B. Good aeration.

C. Moderate temperatures

V. Any two from each following group.

- A. Tip layerage
  1. Trailing blackberries
  2. Dewberries
  3. Blackberries
  4. Purple raspberries
  5. Boysenberry
- B. Air layerage
  1. Dogwood
  2. Magnolia
  3. Holly
  4. Camellia
  5. Azalea
  6. Rubber plants
  7. Schefflera
  8. Gracaena
- C. Simple layerage
  1. Dieffenbachia
  2. Ivy
  3. Philodendron
  4. Strawberries
- D. Compound layerage
  1. Muscadine grapes
  2. Wisteria
  3. Clematis
- E. Mound layerage
  1. Clonal apple stocks
  2. Quince

3. Currants

4. Gooseberry

F. Trench Layerage

1. Azaleas

VI. A. These new plants will have a larger vegetative growth than the roots can support.

B. The root should be further developed before planting.

C. In some cases prune the tops back to a size the root can support.

SECTION D

SUB UNIT I

SIMPLE LAYERING

PLANT PROPAGATION - LAYERING

SIMPLE LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

VII. Know the following facts about simple layering.

- a. Time for layering.
- b. Removal time of new plant.
- c. Care of new plants.

INFORMATION SHEET

VII. Simple Layering

A. Time for layering

1. In early spring.
2. Dormant one year old shoots are used.
3. Low, flexible branch that can be bent to ground are used.
4. Shoots older than one year are not satisfactory for layering.

B. Removal time for new plants

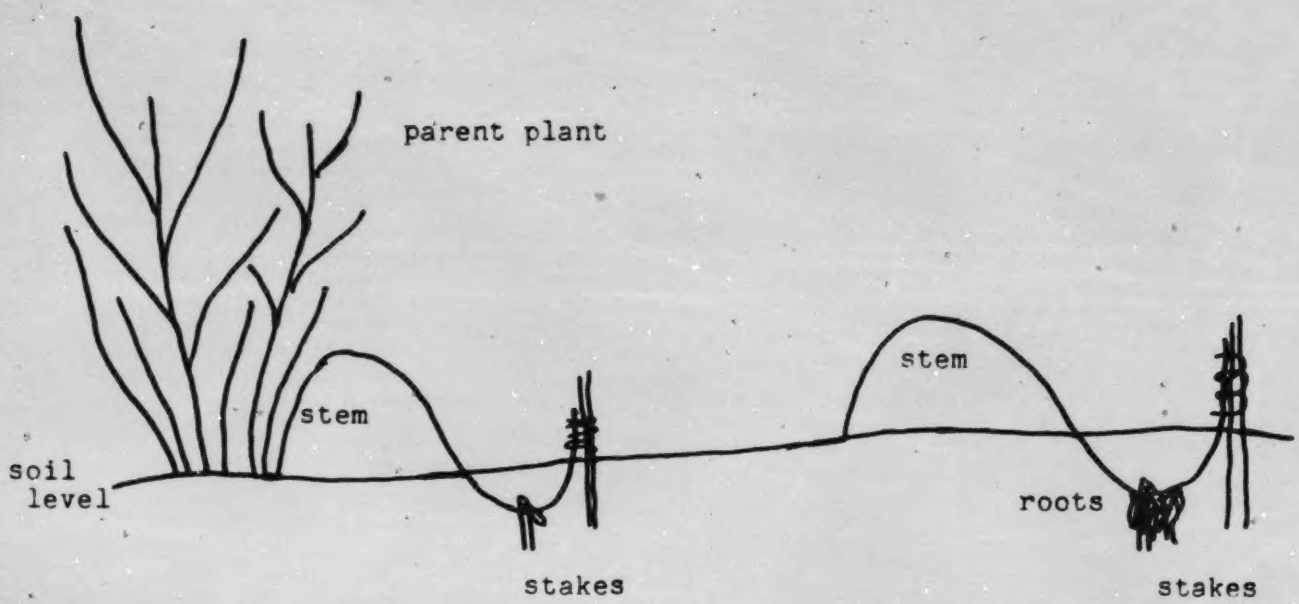
1. Shoots layered in spring are ready to be removed in the fall or next spring before new growth begins.
2. Shoots layered in summer remove next spring or wait till end of second growing season.

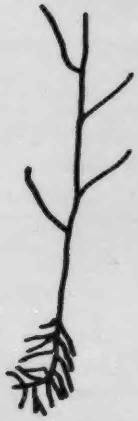
C. Care of new plant

1. Treated same as a rooted cutting of the plant.
2. Keep evergreens potted and cool and humid.
3. Can plant new plant directly into nursery row of permanent location if top is reduced to correspond with the roots.
4. Rooted layers removed in fall can be planted in a cold frame,a shaded greenhouse in a peat sand mixture.

PROPAGATION BY SIMPLE LAYERING

OH - 61-D


parent plant
stem
soil level
stakes
stem
roots
stakes



rooted plant that has been removed from the parent plant

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #1 - SIMPLE LAYERING

A. Bend a branch over to the ground, covering it partially with soil but leaving the terminal end exposed.

B. End of branch is sharply bent to upright position 6-12 inches back from tip.

C. The sharp bending may be enough to induce rooting but twisting to loosen bark additional benefit is gained.

D. Cutting or notching the underside of stem is used.

E. The bend part of shoot is inserted to soil to be covered to a depth of 3-6 inches.

F. Use a peg or other object to hold layer in place.

G. If branch is not flexible the tension can be relieved by cutting the upper side of the shoot.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

VII. Simple Layering

A. Time for layering (True or false)

________ 1. In the fall.

________ 2. Dormant year old shoot can be used.

________ 3. Stiff branches are used.

________ 4. Shoots older than 1 year are satisfactory.

B. When to remove new plants.

1. Shoots layered in spring should be removed (when)________________________________

2. Shoots layered in summer should be removed (when)________________________________

C. Care of new plants.

________ 1. Should be treated same as rooted cutting.

________ 2. Evergreens should be kept warm and dry.

________ 3. If top is reduced to match root system it can be planted directly into permanent location.

________ 4. Rooted layers removed in fall can be planted in a cold frame.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

VII. Simple Layering:

A. 1. False
   2. True
   3. False
   4. False

B. 1. Fall or next spring before new growth begins.
   2. Next spring or at end of second growing season.

C. 1. True
   2. False
   3. True
   4. True

SECTION D

SUB UNIT V

TIP LAYERING

PLANT PROPAGATION - LAYERING

TIP LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

VIII. Know the following facts about tip layering.

- a. Facts about tip layering.
- b. Preparing plants for tip layering.
- c. If tip layering is done to soon.
- d. If tip layering is done to late.
- e. When to remove new plants.

PLANT PROPAGATION - LAYERING

INFORMATION SHEET

VIII. Tip Layering:

A. Facts about tip layering.

1. Rooting takes place near tip of current seasons shoots.
2. Shoot tip grows downward into soil.
3. Natural characteristics of blackberries, dewberries and black and purple raspberries.

B. Preparing plants for tip layering.

1. Stems are biennial.
2. Vegetative first year; fruitful second year; pruned out third year.
3. Should set aside stock for layering purpose only.
4. Healthy plants are set out twelve feet apart.
5. Cut plant down to nine inches above the ground at time of planting.
6. Vigorous new canes are cut back 3-4 inches after they reach a height of 18-30 inches.
7. Late summer canes begin to arch over.
8. Terminal ends become elongated.
9. Leaves small and curl.
10. Tip layer when part of lateral tip have their appearance.

C. If tip layering is done to soon.

1. Shoots continue to grow instead of forming a terminal bud.

D. If tip layering is done to late.

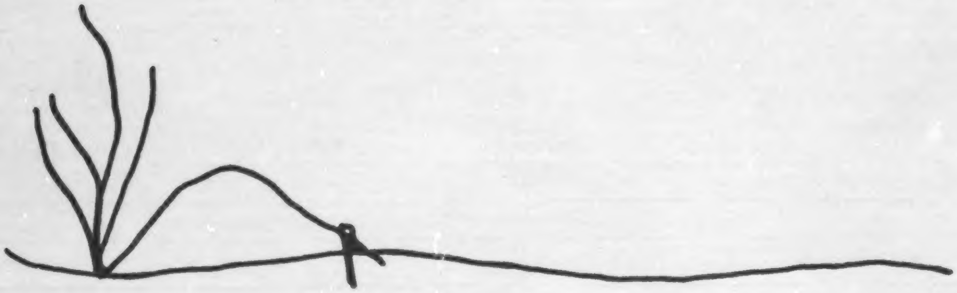
1. Root system will be small.

INFORMATION SHEET

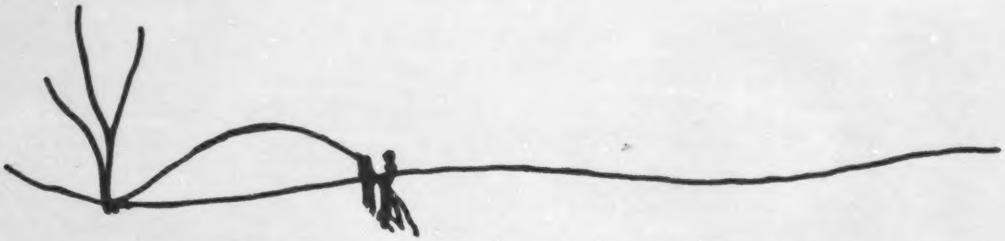
E. When to remove new plants.

1. Dig new plant at the end of same season.
2. Since plants are tender dig just prior to replanting.

PROPAGATION BY TIP LAYERING



TIP OF THE STEM IS PLACED BELOW THE SOIL



Tip of the stem has rooted and a new plant is formed.

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #2 - TIP LAYERING

A. Have the student perform a tip layering.

   1. Dig hole with one side vertical and one side sloping toward parent plant.

   2. Tip is placed in hole.

   3. Lay the shoot along the sloping side.

   4. Press soil firmly against the shoot covering it completely.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #2

To the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

VIII. Tip Layering:

A. Facts about tip layering (Fill in blank)

1. Rooting takes place near ______________ of current.

2. Shoot tips grow _________________ into the soil.

3. This is a natural ___________________ of blackberries, dewberries, etc.

B. Preparing plants for tip layering (True or false)

_______ 1. Stems are biennial.

_______ 2. Vegetative first year; fruitful the second year and are pruned out the third year.

_______ 3. Set aside stock for layering purposes only.

_______ 4. Set plants out 10 feet apart.

_______ 5. At time of planting plants are cut back to 9 inches above ground.

_______ 6. New canes should be cut back after they reach a height of 18-30 inches.

_______ 7. Should layer when lateral tip becomes elongated and leaves small and curl up.

C. If tip layering is done too soon what will happen?

D. If tip layering is done too late what will happen?

E. When should new plants be removed and planted?

1.

2.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

VIII. Tip Layering:

A. 1. Tip

  2. Downward

  3. Characteristics

B. 1. True

  2. True

  3. True

  4. False

  5. True

  6. True

  7. True

C. Shoots continue to grow instead of forming terminal bud.

D. Root system will be small.

E. 1. At end of same season.

  2. Just prior to planting.

SECTION D

SUB UNIT IV

COMPOUND LAYERING

PLANT PROPAGATION - LAYERING

COMPOUND LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

IX. Know the following facts about compound layering.

    a. Facts about compound layering.

PLANT PROPAGATION - LAYERING

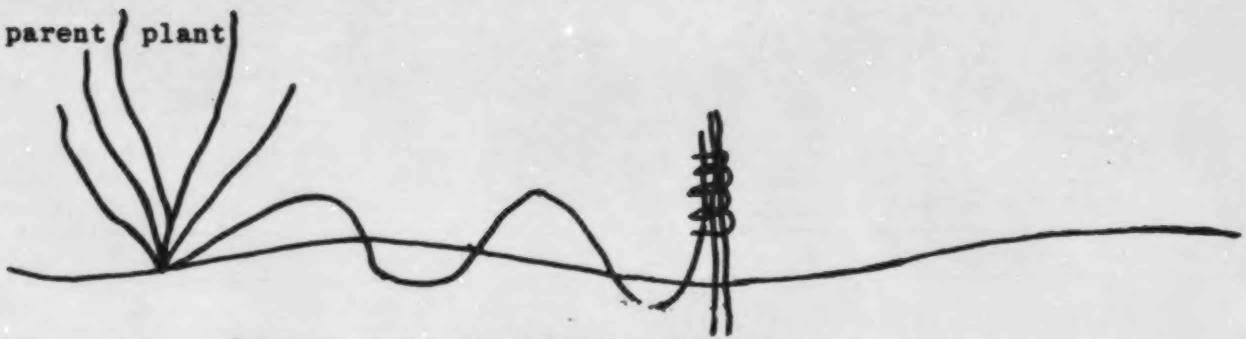
INFORMATION SHEET

IX. Compound layering:

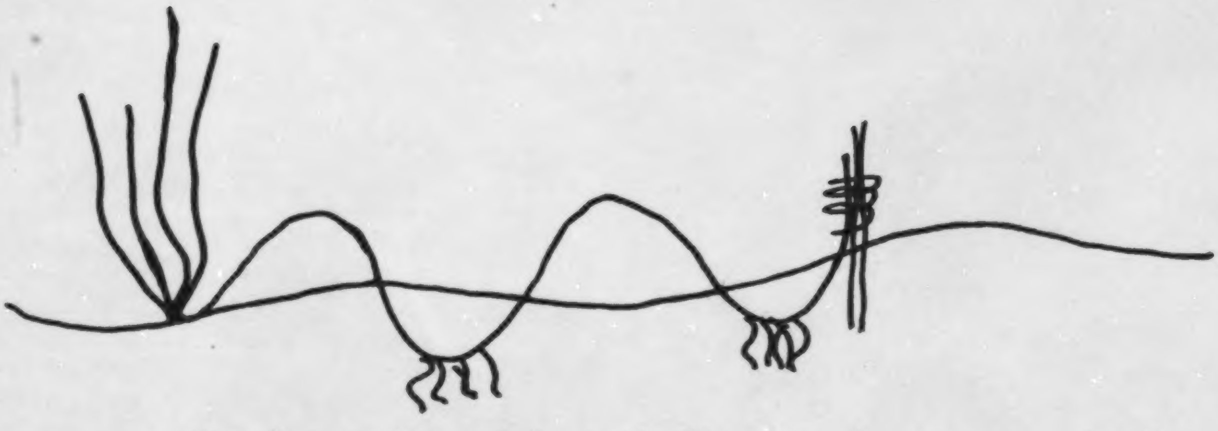
A. Facts about compound layering.

1. Essentially same as simple layering.
2. Used to propagate plants with long flexible shoots.
3. After rooting takes place at end of growing season, cut the branches into sections made up of new shoots and roots.

PROPAGATION BY COMPOUND LAYERING


parent plant

Stem covered at several points



stem has rooted and is ready for removal

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #3 - COMPOUND LAYERING

A. Have the students perform a compound layering.

1. Branch is alternately covered and exposed along its length.

2. Stem is injured at the lower part of the stem and covered in same manner as simple layering.

3. Roots develop at each buried section.

4. The exposed part of stem should have at least one bud to develop into a new shoot.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #3

To the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

IX. Compound Layering:

A. Facts about compound layering (True or false)

_______ 1. Is the same as simple layering.

_______ 2. Used on plants with short stiff branches.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

IX. Compound Layering:

A. 1. True

2. False

SECTION D

SUB UNIT VI

AIR LAYERING

PLANT PROPAGATION - LAYERING

AIR LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

X. Know the following facts about air layering.

  a. Facts about air layering.

  b. Enclosures used to cover the rooting medium.

  c. When to air layer.

  d. When to remove the layered stem.

  e. Care of new plants.

PLANT PROPAGATION - LAYERING

INFORMATION SHEET

X. Air Layering:

A. Facts about air layering.

1. Roots form on the aerial part of the plant.
2. Best results are obtained in greenhouses or areas of high humidity.
3. Numerous active leaves on the layered shoots speed root formation.
4. Tropical greenhouse plants should be done after several leaves have developed during a growth period.

B. Enclosures used to cover the rooting medium.

1. Metal
2. Wooden boxes
3. Split flower pots
4. Waxed paper cones
5. Rubber sheeting
6. Polyethylene folm
7. Aluminum foil
8. Sphagnum moss

C. When to air layer.

1. Spring
    a. On previous seasons growth.
2. Summer
    a. On partially hardened shoots.
3. Wood older than one year can be used but rooting is poor.

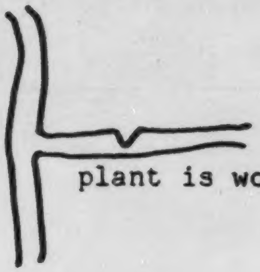
D. When to remove the layered stem.

1. Best determined by the root formation.
2. Rooting may occur 2-3 months or less in some plants.
3. Layers made in spring or summer should be left till plant is dormant.
4. Holly, lilac, azalea and magnolia should be left for two seasons.

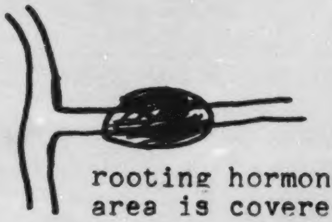
E. Care of new plant.

1. Should be potted in suitable container.
2. Put in cool humid place.
3. Place plant under mist system.

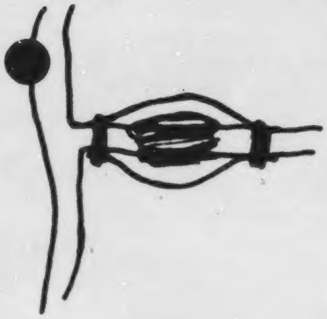
PROPAGATION BY AIR LAYERING



plant is wounded



rooting hormone is added and the area is covered with sphagnum moss



the whole area is covered with plastic

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #4 - AIR LAYERING

A. Have student air layer a specified plant in the greenhouse.

1. Girdle or cut bark of stem 6-12 inches or more from end of tip.
2. Remove strip of hard ½-1 inch wide depending on kind and size of plant.
3. Scrape the exposed surface to retard healing.
4. Other procedure for wounding stems include:
    a. A slanted cut about 2" long and up to the center of the stem, keep the two apart by inserting a tooth pick.
    b. Cut a "V" shaped notch in the stem to the center.
5. Apply rooting compound to the wound.
6. Apply two handfulls of slightly moist sphagnum moss around the wounded stem.
7. Wrap the ball of moss with plastic film and tie down each end.
8. Remove and plant stem when roots are well formed.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #4

To the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

X. Air Layering:

A. Facts about air layering (True or false)

_______ 1. Roots will form on the aerial part of the plant.

_______ 2. Best results occur in a greenhouse or a place with low humidity.

_______ 3. Numerous active leaves on a shoot speed up root formation.

_______ 4. Tropical plants can be air layered at any time.

B. Substances used to cover the rooting medium (List any five)

1.

2.

3.

4.

5.

C. When are the best times to air layer?

1.

2.

D. When to remove the layered stem. (True or false)

_______ 1. Is dependant on root formation.

_______ 2. Rooting usually occurs after four months.

_______ 3. If made in spring or summer it should be left till it is dormant.

_______ 4. Holly and lilac should be left for one season before removing.

E. Care of new plants (List three facts)

1.

2.

3.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

X. Air Layering:

A. 1. True
   2. False
   3. True
   4. False

B. Any five of the following:
   1. Metal
   2. Wooden boxes
   3. Split flower pots
   4. Waxed paper cones
   5. Rubber sheeting
   6. Polyethylene film
   7. Aluminum foil
   8. Sphagnum moss

C. 1. Spring
   2. Summer

D. 1. True
   2. False
   3. True
   4. False

E. 1. Should be potted in suitable containers.
   2. Should be put in cool humid place.
   3. Should be placed under a mist system.

SECTION D

SUB UNIT II

MOUND LAYERING

PLANT PROPAGATION - LAYERING

MOUND LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

XI. Know the following facts about mound layering.

- a. Facts about mound layering.
- b. Preparing stool beds.
- c. Stool bed maintenance.

PLANT PROPAGATION - LAYERING

INFORMATION SHEET

XI. Mound (Stool) Layering:

A. Facts about mound layering.

1. Involves cutting plant back to ground during dormant season and apply soil to encourage root formation.
2. Plant with stiff branches that don't bend easy are well suited for this type of layering.
3. Shoots that do not root properly should be cut off and treated as hardwood cuttings.

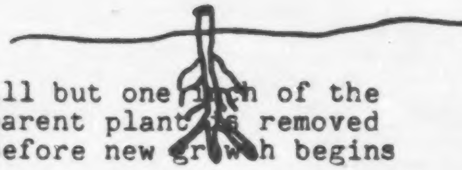
B. Preparing stool beds.

1. In loose, fertile, well drained soil one year before propagation begins.
2. Parent plants are set 12-15 inches apart in rows.
3. Space rows far enough apart to allow cultivation.
4. Plant in shallow trenches.
5. Cut plants back 15-18 inches from ground and let them grow unchecked for a season.
6. Space between rows should be cultivated.

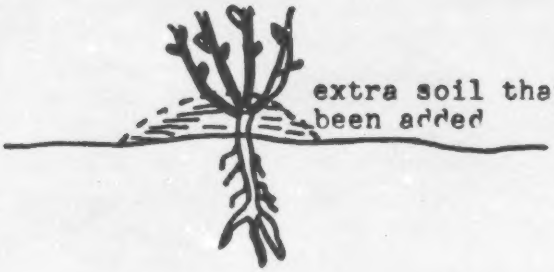
C. Stool bed maintenance.

1. Can be used up to 20 years.
2. Observe proper disease insect and weed control.
3. Overhead irrigation may be essential to keep proper moisture level.

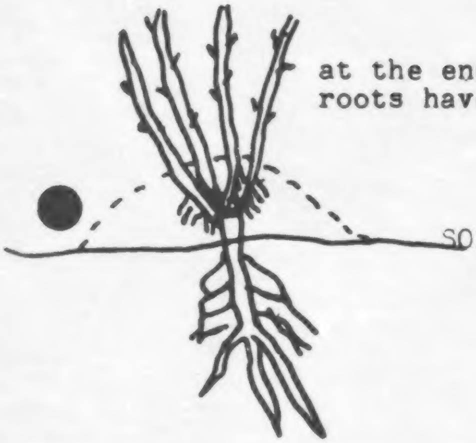
PROPAGATION BY MOUNDLAYERING



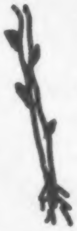
all but one inch of the parent plant is removed before new growth begins



extra soil that has been added



at the end of the season roots have formed



rooted layer that has been removed

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #5 - MOUND LAYERING

A. Have student prepare a mound layer.

1. Cut plants back to an inch above the ground before new growth begins in spring.
2. When new shoots reach 3-5 inches place loose soil around stem to ½ their length.
3. Add soil to ½ total height when stem reaches 8-10 inches.
4. In mid summer add soil to cover the base of shoots to a depth of 6-8 inches.
5. When shoots are well rooted remove from parent plant.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #5

to the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

XI. Mound or (Stool) Layering:

A. Facts about mound layering (Fill in blanks)

1. Cut back plant to the ground during the ______ ____________ season.

2. Plants with ____________ branches are well suited for this type of layering.

3. Shoots that do not root properly should be treated as ______________ cuttings.

B. Preparing Stool Beds (True or false)

________ 1. Beds should be established in loose fertile soil.

________ 2. Parent plants are set 6 inches apart.

________ 3. Space rows close together as their is no need to cultivate.

________ 4. Plants should be pruned and left to grow for one season.

C. Stool bed maintenance.

1. List three rules to follow in stool bed maintenance.

a.

b.

c.

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

XI. Mound Layering:

A. 1. Dormant

2. Stiff

3. Hardwood

B. 1. True

2. False

3. False

4. True

C. a. Can be used up to 20 years.

b. Use proper disease insect, and weed control.

c. Overhead irrigation may be needed to keep proper moisture level.

SECTION D

SUB UNIT III

TRENCH LAYERING

PLANT PROPAGATION - LAYERING

TRENCH LAYERING

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

XII. Know the following facts about trench layering.

- a. Facts about trench layering.
- b. Preparing a parent bed.
- c. When to remove a new plant.

PLANT PROPAGATION - LAYERING

INFORMATION SHEET

XII. Trench Layering:

A. Facts about trench layering.

1. A nursery method used on fruit trees hard to propagate by other means.
2. Can also be used on established shrubs or trees.

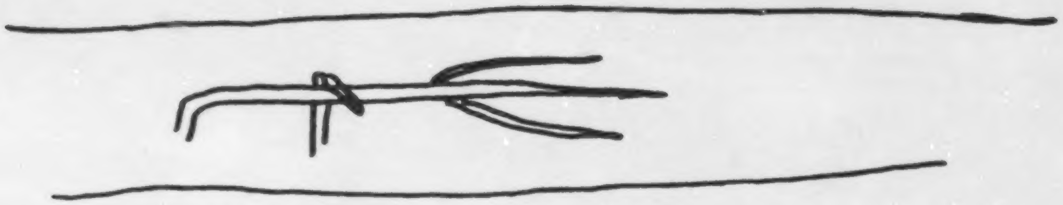
B. Preparing a parent bed.

1. Plant stock 18-30 inches apart at an angle of 30-45 degrees down a row.
2. Have rows 4-5 feet apart.
3. Pull soil up around plants to a height of 6".
4. Cut all plants back to a height of 18-24".
5. Let them grow one season.

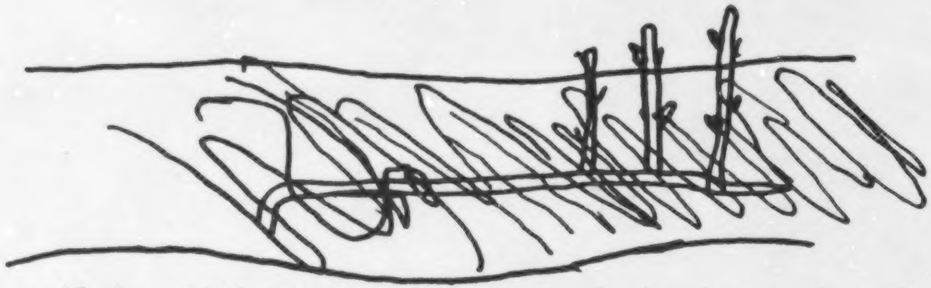
C. When to remove new plants.

1. After plants become dormant or next spring, cut new plant from parent plant as close to base as possible.

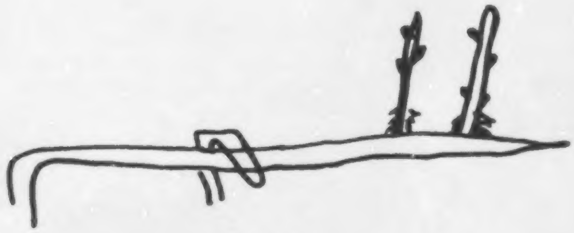
PROPAGATION BY TRENCH LAYERING



before new growth begins shoot is laid flat in the bottom of the trench



soil is added to cover the base of the developing shoots



shoots have formed roots and are ready to be removed

PLANT PROPAGATION - LAYERING

ASSIGNMENT SHEET #6 - TRENCH LAYERING

A. Have student perform procedure for trench layering.

1. Before growth in spring, parent plants are bent over or laid flat on bottom of a 2 inch ditch.
2. Cut weak lateral branches back to ½ inch.
3. Tip strong lateral branches.
4. Use pegs or wire to hold plant down.
5. Is important that all shoots are completely flat on floor of trench.
6. Cover shoot with 2 inches of soil.
7. Add an inch layer of soil when shoots have pushed through soil but leaves have not expanded.
8. When shoots reach 3-4 inches add soil to ½ its length.
9. Keep adding soil till base of shoots are covered to a depth of 6-8 inches by mid summer.

PLANT PROPAGATION - LAYERING

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #6

To the satisfaction of the instructor.

PLANT PROPAGATION - LAYERING

TEST

XII. Trench Layering:

A. Facts about trench layering (Fill in blank)

1. Is a method used on fruit trees hard to ______________________ by other means.

2. Can be used on established shrubs or ________.

B. Preparing a parent bed (Fill in blank)

1. Plant stock ______ to ______ inches apart at an angle of _______ to _______ degrees in the row.

2. Rows should be ______ to _____ feet apart.

3. Pull soil up around plants to a height of __________ inches.

4. ______________ all plants back to a height of 18-24 inches.

5. Plants should be allowed to grow ____________ season.

C. When to remove new plants.

1. When should the new plant be removed?

PLANT PROPAGATION - LAYERING

ANSWERS TO TEST

XII. Trench Layering:

A. 1. Propagate

  2. Trees

B. 1. 18-30"; 30-45°

  2. 4-5

  3. 6

  4. Cut

  5. One

C. 1. After plant becomes dormant or next spring.

SECTION D

UNIT III

DIVISION

PLANT PROPAGATION

DIVISION

TERMINAL OBJECTIVE

After completion of this unit, the student will know several types of plants produced by division and how to produce plants by division. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with division to the correct definition.

II. List five types of plants produced by division.

III. List five plants produced by division.

IV. List the procedure for producing plants by division.

PLANT PROPAGATION

DIVISION

SUGGESTED ACTIVITIES

I. Instructor:

  A. Provide students with objective sheet.

  B. Provide students with information and assignment sheets.

  C. Make transparencies.

  D. Discuss terminal and specific objectives.

  E. Discuss information and assignment sheets.

  F. Give test.

II. Student:

  A. Read objective sheet.

  B. Study information sheets.

  C. Complete assignment sheets.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objectives

  B. Information sheet

  C. Transparency masters

    1. TM 1 - Asexual Propagation Through Division (Stolon)

    2. TM 2 - Asexual Propagation Through Division (Rhizomes)

3. TM 3 - Asexual Propagation Through Division (Tubers)

D. Assignment sheets

1. Assignment sheet #1 - Producing Perrenial By Division

2. Assignment sheet #2 - Producing Bulbs By Division

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Curriculum Manual, Horticulture I, New Mexico State Department of Education.

III. Additional teaching materials:

A. Garden forks

B. Sulfur

C. Spades

PLANT PROPAGATION

DIVISION

INFORMATION SHEET

I. Terms and definitions:

A. RHIZOMES - A specialized stem structure in which the main axis of the plant grows horizontally at or just below the ground.

B. BULBS - A specialized underground organ consisting of a short, fleshy usually vertical stem axis bearing at its apex a growing point or a flower primorduim enclosed by thick, fleshy scales.

C. PERENNIALS - Plants that live for more than two years and have an annual regeneration cycle.

II. Types of plants propagated by division.

A. Stolons

B. Bulbs

C. Perennials

D. Stem tubers

E. Rhizomes

F. Tuberous Roots

III. Plants produced by division.

A. Iris

B. Geranium

C. Shrubs

D. Strawberries

E. Daffodils

F. Daylillies

INFORMATION SHEET

IV. Procedure for producing plants by division.

A. Take up plant leveling a clump of soil around it. (In dormant season or after blooming)

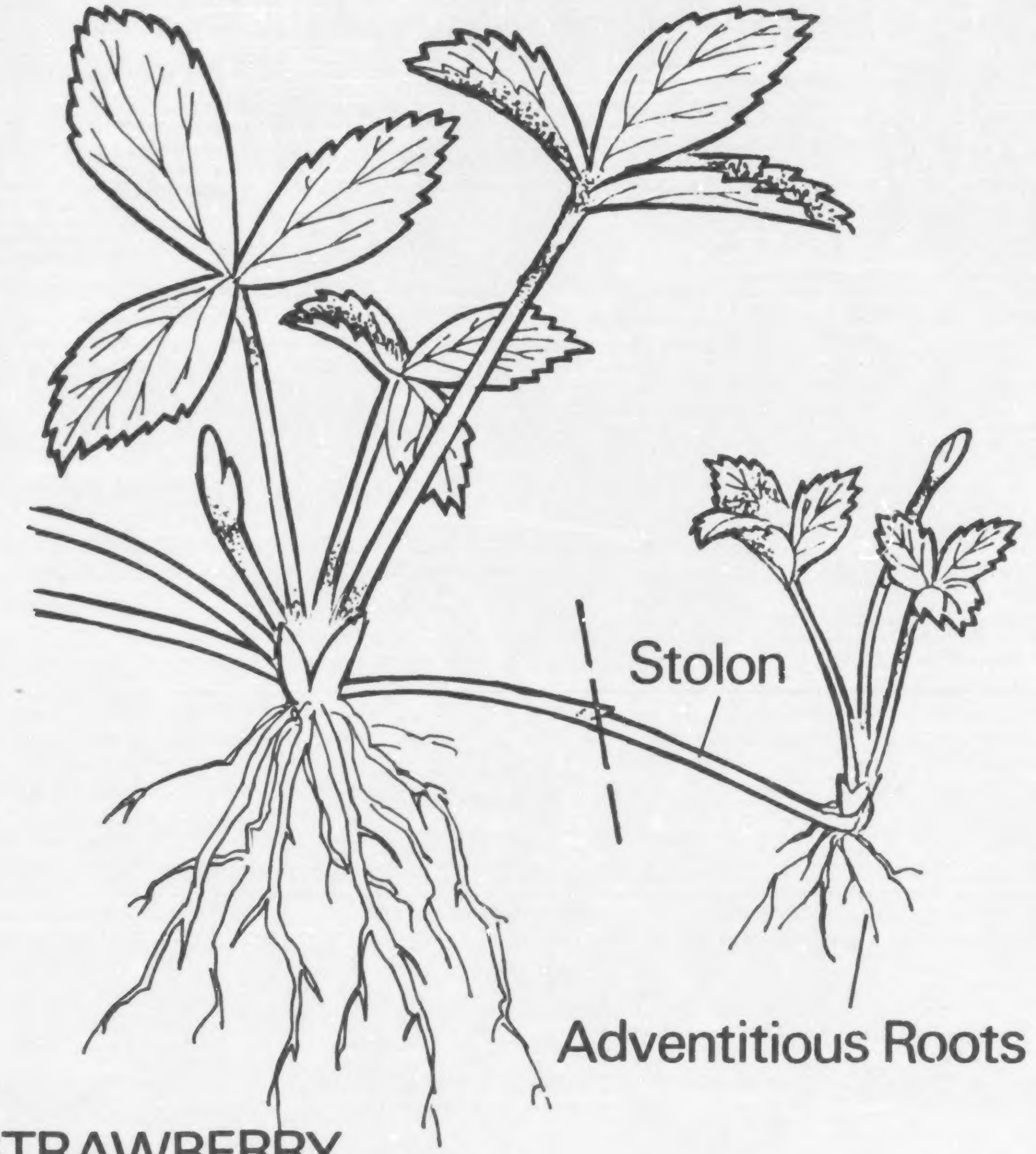
B. Shake soil from plant.

C. Divide each plant clump into smaller parts.

D. Spray each plant.

E. Plant in boxes or their permanent place.

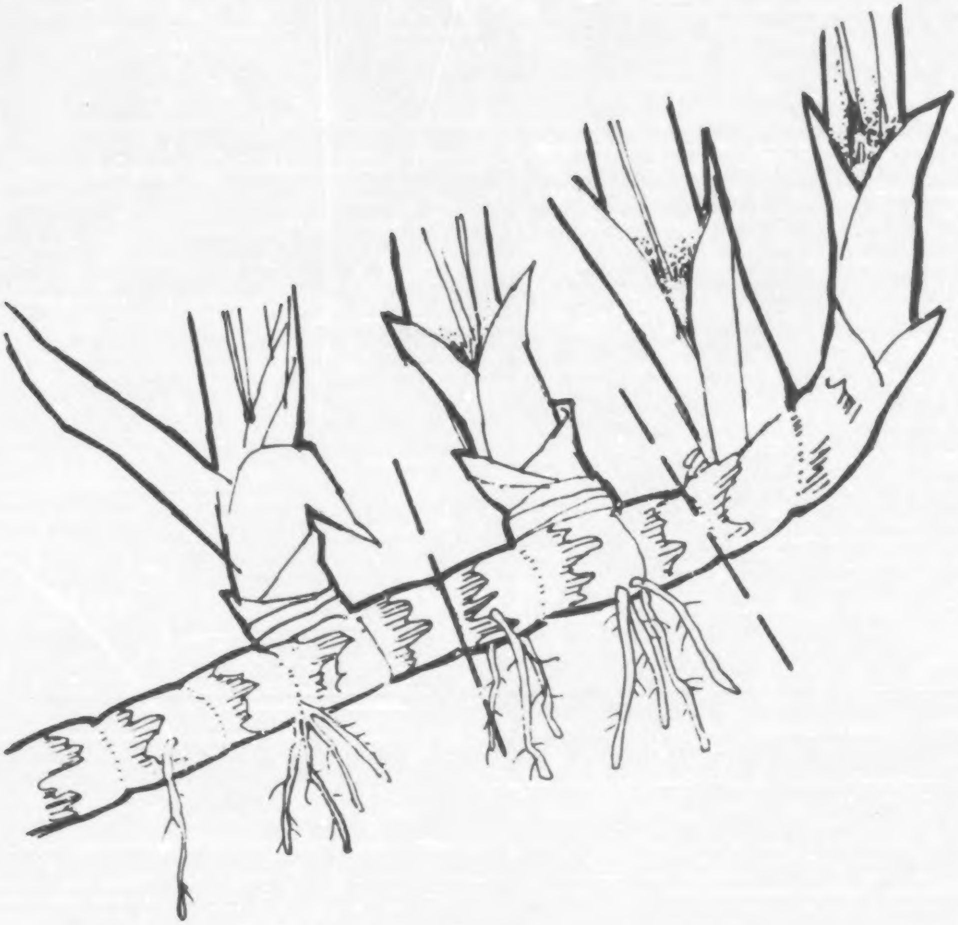
Asexual Propagation through Division (Stolon)


Stolon
Adventitious Roots

STRAWBERRY

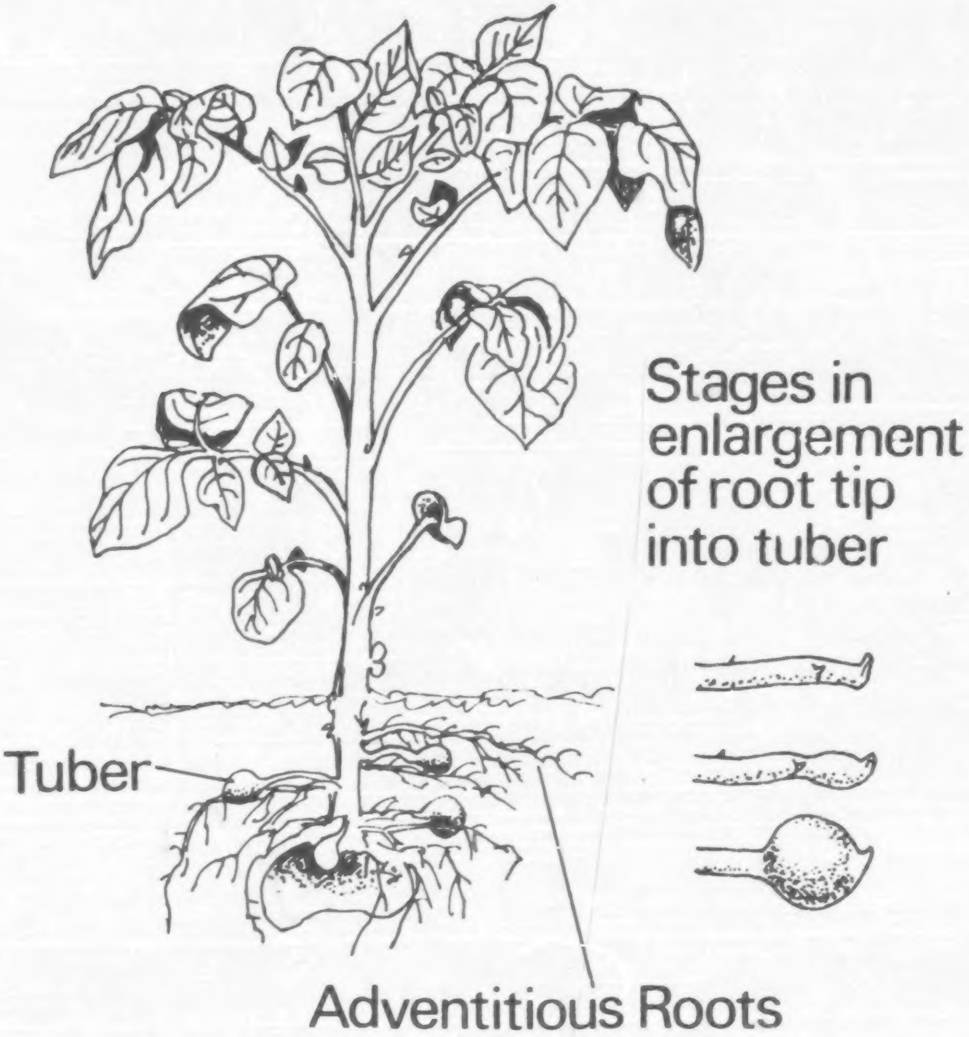
280

Asexual Propagation through Division (Rhizomes)



IRIS

Asexual Propagation through Division (Tubers)


Tuber
Adventitious Roots

Stages in enlargement of root tip into tuber

POTATO

PLANT PROPAGATION

DIVISION

ASSIGNMENT SHEET #1 - PRODUCING PERRENIAL BY DIVISION

A. Have student produce plant by division.

1. Select healthy plants that are crowded and several years old.
2. In early fall dig around plant till it can be lifted.
3. Separate the plant into several clumps.
4. Treat each plant root for diseases.
5. Plant as soon as possible.

PLANT PROPAGATION

DIVISION

ASSIGNMENT SHEET #2 - PRODUCING BULBS BY DIVISION

A. Have student produce plants from bulbs.

1. After foliage is dried up remove plant from soil.
2. Shake soil free and remove the bulbs.
3. Treat bulbs for disease.
4. Store bulbs in cool, dry place until fall then plant.

PLANT PROPAGATION

DIVISION

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

Assignment sheet #2

To the satisfaction of the instructor.

PLANT PROPAGATION

DIVISION

TEST

I. Match the terms listed below to the correct definition.

___A. A specialized stem structure in which the main axis of the plant grows horizontally at or just below the ground.

___B. Plants that live for more than two years and have an annual regeneration cycle.

___C. A specialized underground organ consisting of a short, fleshy usually vertical stem axis bearing at its apex growing point or a flower primordium enclosed by thick fleshy scales.

1. Rhizomes
2. Bulbs
3. Perennials

II. List five types of plants propagated by division.

A.

B.

C.

D.

E.

III. List five plants produced by division.

A.

B.

C.

D.

E.

IV. List the procedure for producing plants by division.

A.

B.

C.

D.

E.

PLANT PROPAGATION

DIVISION

ANSWERS TO TEST

I. A. 1

B. 3

C. 2

II. Any five of the following:

A. Stolons

B. Bulbs

C. Perennials

D. Stem tubers

E. Rhizomes

F. Tuberous roots

III. Any five of the following:

A. Iris

B. Geranium

C. Shrubs

D. Strawberries

E. Daffodils

F. Daylillies

IV. To the satisfaction of the instructor.

SECTION D

UNIT IV

SEEDS AND THIER GROWTH

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

TERMINAL OBJECTIVE

After completion of this unit, the student will be associated with terms concerning seeds, how to prepare seeds for growing plants in trays and how to transplant when the time arises. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

I. Match terms associated with seeds to the correct definition.

II. List five parts of the seed.

III. Know the purpose of the seed part.

IV. Discuss factors that good seed germination depends on.

V. Discuss the seed germination procedure.

VI. List eight things good seed viability depends on.

VII. List four characteristics of a good seeding medium.

VIII. Give several medium mixtures.

IX. Know how to sterilize soil.

X. List five factors associated with seeding flats.

XI. Know how to care for plants after germination.

XII. Discuss seedling care prior to transplanting.

XIII. List four factors in selecting pots for transplanting.

XIV. List four transplanting facts.

XV. List three steps in hardening plants.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

SUGGESTED ACTIVITIES

I. Instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheet.

   C. Make transparencies.

   D. Discuss terminal and specific objectives.

   E. Discuss information and assignment sheets.

   F. Give test.

II. Student:

   A. Read objectives.

   B. Study information sheets.

   C. Complete each assignment sheet.

   D. Make sure you are able to perform according to the type of performance called for by each specific objective.

   E. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objectives

   B. Information sheets

   C. Transparency masters

      1. TM 1 - Germination of Bean and Corn Seeds

      2. TM 2 - Views of Bean and Corn Seed

3. TM 3 - Killing Time for Various Soil Organisms When Using Steam Sterilization (or Pasteurization)

D. Assignment sheets

1. Assignment sheet #1 - Parts of Seed

2. Assignment sheet #2 - Planting in Flats

3. Assignment sheet #3 - Transplanting

E. Answers to assignment sheets

F. Test

G. Answers to test

II. References:

A. Curriculum Manual, Horticulture I, New Mexico State Department of Education.

III. Additional teaching materials:

A. Seeding flats

B. Medium

C. Containers

D. Seeds

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

INFORMATION SHEET

I. Terms and definitions:

  A. SEED PROPAGATION - Increase in plant population by seeds.

  B. VIABILITY - Ability of a seed to be able to germinate.

  C. VARIETY - A group of closely related plants.

  D. SEED - A ripened ovule.

  E. COTYLEDONS - Seed leaves of the embryo, also food storage are for dicots.

  F. DICOTYLEDONUS PLANTS - Plants with two seed leaves in the seed.

  G. MONOCOTYLEDONUS PLANTS - Plants with one seed leaf in the seed.

  H. HOT BED - A covered frame heated with manure or other heat source.

  I. COLD FRAME - A frame covered but not heated except by exposure to the sun.

II. Five parts of the seed.

  A. Seed coat

  B. Embryo

  C. Cotyledons

  D. Plumule

  E. Root tip

III. Purpose of seed parts.

  A. Seed coat

    1. Prevents drying out

    2. Holds food supply for new plant

INFORMATION SHEET

    3. Protect embryo from injury

  B. Embryo

    1. Dicot cotyledons store food and protect plumule.
    2. Monocot cotyledons protect plumule.
    3. Monocot and Dicot plumules contain growth potential for new plant.
    4. Monocot and Dicot root tips take in nutrients and water and hold plant in soil.

  C. Endosperms

    1. Stores food for plumule

IV. Good seed germination depends on.

  A. Quality of seed
  B. Moisture
  C. Temperature
  D. Air
  E. Seed maturity
  F. Light

V. Seed germination procedure.

  A. Seed absorbs water.
  B. Seed coats soften and enlarge.
  C. Seed swells causing seed coat to split.
  D. Primary root growth out from the split into the soil.
  E. Upper portion of plant emerges from soil.
  F. Cotyledons open.
  G. True leaves unfold.

INFORMATION SHEET

VI. Eight things good seed viability depends on.

- A. Seed damage
- B. Age of seed
- C. Wetness of soil
- D. Temperature
- E. Seed hardness
- F. Diseases
- G. Planting depth
- H. Dormancy

VII. Four characteristics of a geed seeding medium.

- A. Porous
- B. Sterile
- C. Nutritious
- D. Lightweight

VIII. Medium mixtures for seeding.

- A. Two parts soil-two parts peat-one part sand
- B. Soil and peat mixed equally
- C. Peat moss or vermiculite-add fertilizer
- D. Other commercial mixtures

IX. Methods by which to sterilize soil.

- A. Steam
- B. Chemicals
- C. Electricity
- D. Temperature

INFORMATION SHEET

X. Factors associated with seeding in flats.
   - A. Soil sterility
   - B. Seed spacing
   - C. Water
   - D. Aeration
   - E. Seed depth

XI. Care for plants after germination.
   - A. Remove cover
   - B. Place in cool spot
   - C. Have adequate air and sun
   - D. Don't over water

XII. Seedling care prior to transplanting.
   - A. Water
     1. Depends on temperature and sunlight
   - B. Temperature
     1. Cool weather plant 50-55° at night
        60-70° in day
     2. Warm weather plant 55-60° at night
        70° in day
     3. Keep temperature as constant as possible
   - C. Light
     1. Excess light causes burned and damaged foliage
     2. Lack of light causes spindling plant
   - D. How to prevent disease
     1. Use proper medium
     2. Use disease free seed
     3. Proper watering

INFORMATION SHEET

4. Proper temperature
5. Proper light
6. Proper air circulation

XIII. Four factors in selecting pots for transplanting.

A. Personal preferences

B. Cost

C. Strength

D. Water holding capacity

XIV. Four transplanting facts.

A. Transplant when first true leaves appear.

B. Place new plants in cool shaded place for several days.

C. Water with fine mist or low pressure so as to not damage plants.

D. Fertilize

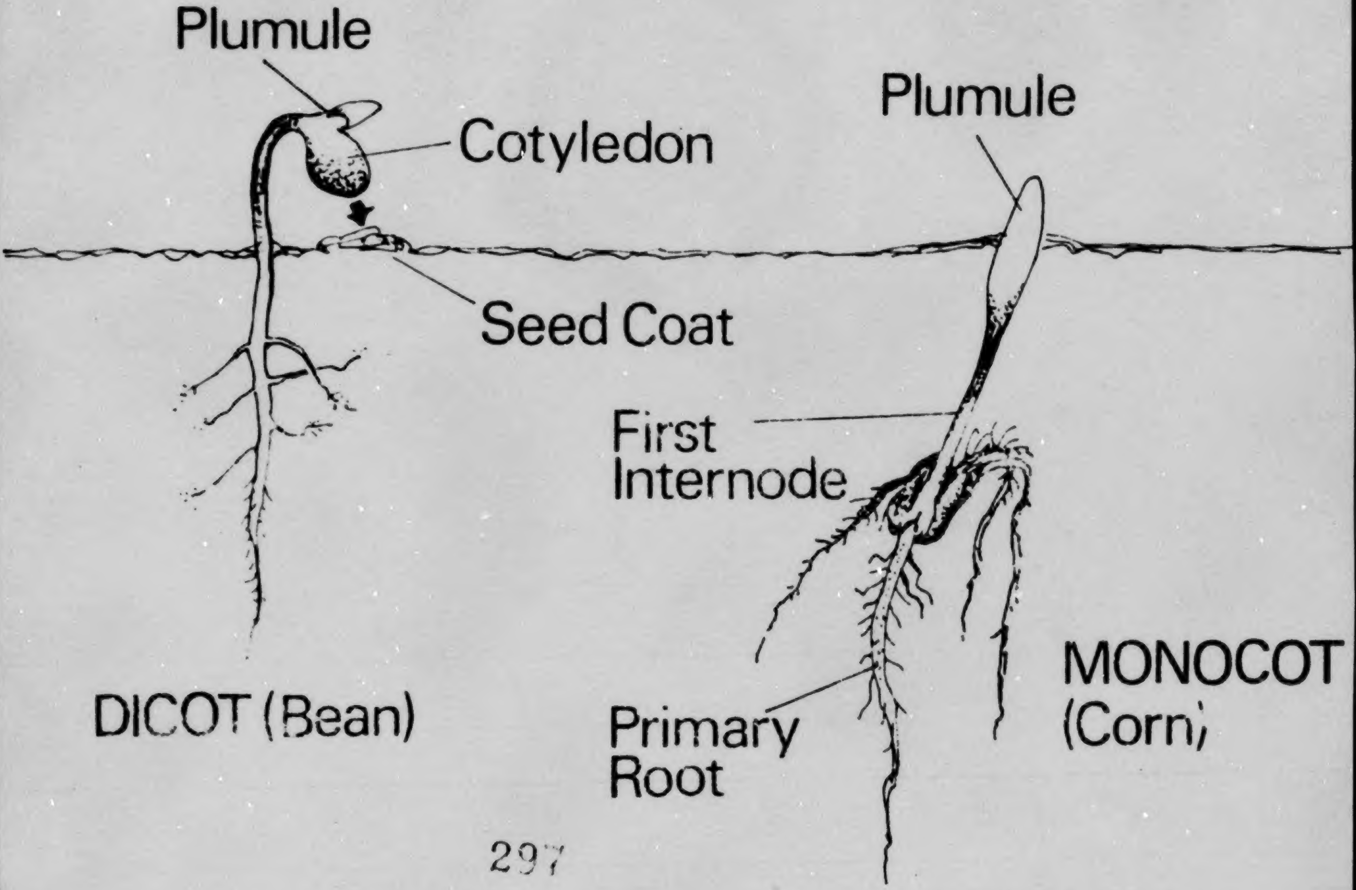
XV. How to harden new plants.

A. Reduce amount of water to each plant.

B. Reduce the temperature to the outside temperature.

C. Should take place for about two weeks.

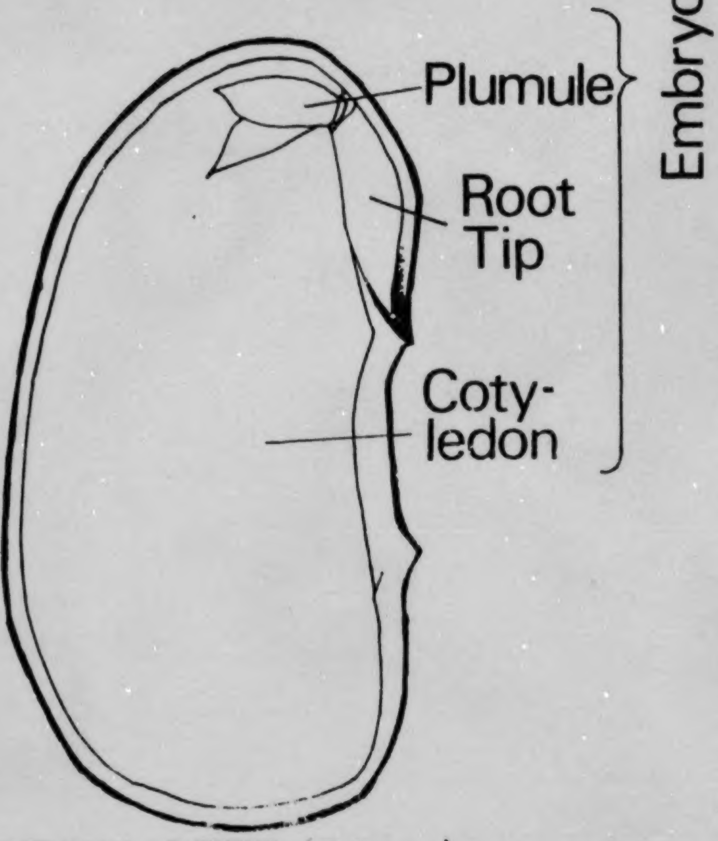
Germination of Bean and Corn Seeds


Plumule
Cotyledon
Seed Coat
DICOT (Bean)
Plumule
First Internode
Primary Root
MONOCOT (Corn)

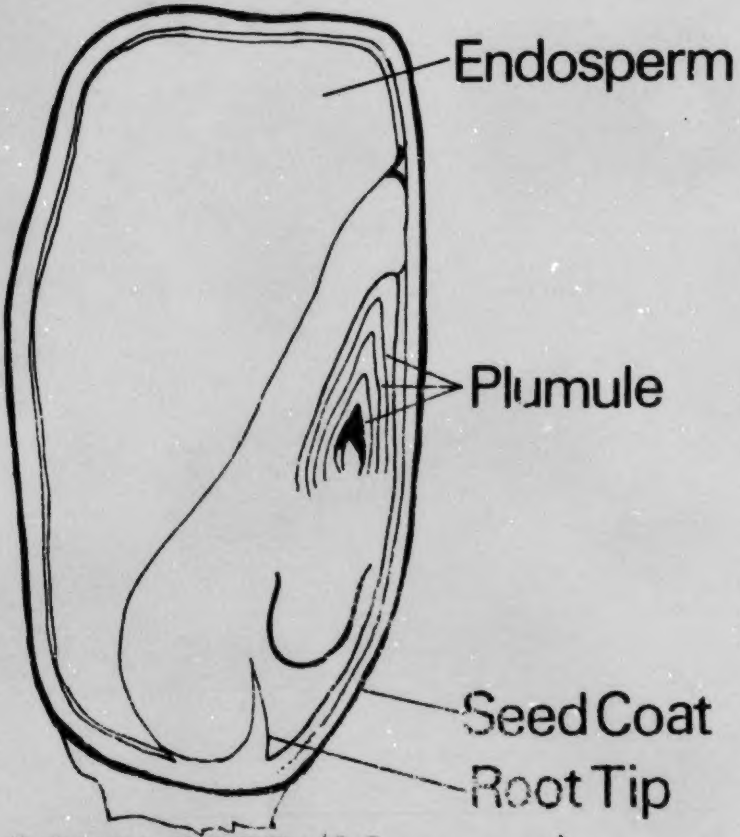
OH - 175-D

TM 2

Views of Corn and Bean Seeds


Plumule
Root Tip
Coty-ledon
Embryo

BEAN SEED (Dicot)


Endosperm
Plumule
Seed Coat
Root Tip

CORN SEED (Monocot)

Killing Time for Various Soil Organisms when using Steam Sterilization (or "Pasteurization")

Organism	Time to Kill	Temperature
Nematodes	Instantly	140° F.
Soil Insects	Instantly	140° F.
Soil Fungi	10 minutes	140° - 160° F.
Soil Bacteria	10 minutes	140° - 160° F.
Weed Seeds	10 minutes	140° - 160° F
Soil Virus	30 minutes	180° F.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

ASSIGNMENT SHEET #1 - PARTS OF SEED

A. Have student identify seed parts.

1. Remove seed coat and split bean so the student will see the embryo and cotyledons.
(Draw, label and identify parts as you find them.)

2. Find and label plumule and root tip.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

ASSIGNMENT SHEET #2 - PLANTING IN FLATS

A. Have each student plant a flat of seeds.

   1. Fill flat to ½ or ¼ inch from the top with soil.
   2. With fingers make several rows about 1¼" apart.
   3. Fill rows with seeds about 1" apart.
   4. Cover seeds with fine amount of soil.
   5. Water the soil down and place trays on tables.
   6. Cover trays with plastic.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

ASSIGNMENT SHEET #3 - TRANSPLANTING

A. Have each student transplant a tray.

   1. Fill pots full of soil.
   2. Carefully remove plants from tray.
   3. Poke a hole in the pots and place plant in it.
   4. Press soil around plant.
   5. Water
   6. Place new plants in cool shaded area.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

Assignment sheet #2

To the satisfaction of the instructor.

Assignment sheet #3

To the satisfaction of the instructor.

OH - 187-D

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

TEST

I. Match the terms listed below with correct definition.

___A. Seed Propagation

___B. Viability

___C. Variety

___D. Seed

___E. Cotyledons

___F. Dicotyledonus

___G. Monocotyledonus Plant

___H. Hot Bed

___I. Cold Frame

1. Plants with two seed leaves in the seed.

2. Plants with one seed leaf in the seed.

3. Seed leaves of the embryo, also food storage are for dicots.

4. A covered frame heated with manure or other heat source.

5. A frame covered but not heated except by exposure to the sun.

6. A ripened ovule.

7. Increase in plant population by seeds

8. Ability of a seed to be able to germinate.

9. A group of closely related plants.

II. List five parts of the seed.

A.

B.

C.

D.

E.

III. List the purpose of the seed part.

A. Seed coat

1.

2.

3.

B. Embryo

1.

2.

3.

4.

C. Endosperm

1.

IV. Discuss in writing the factors that good seed germination depends on.

V. Discuss in writing the seed germination procedure.

VI. List eight things good seed viability depends on.

A.

B.

C.

D.

E.

F.

G.

H.

VII. List four characteristics of a good seeding medium.

A.

B.

C.

D.

VIII. List four medium mixtures.

A.

B.

C.

D.

IX. List four ways to sterilize soil.

A.

B.

C.

D.

X. List five factors associated with seeding flats.

A.

B.

C.

D.

E.

XI. Discuss in writing care of plants after germination.

XII. Discuss in writing seedling care prior to transplanting.

XIII. List four factors in selecting pots for transplanting.

A.

B.

C.

D.

XIV. List four facts about transplanting.

A.

B.

C.

D.

XV. List three steps in hardening plants.

A.

B.

C.

PLANT PROPAGATION

SEEDS AND THEIR GROWTH

ANSWERS TO TEST

I. A. 7

B. 8

C. 9

D. 6

E. 3

F. 1

G. 2

H. 4

I. 5

II. A. Seed coat

B. Embryo

C. Cotyledons

D. Plumule

E. Root tip

III. A. 1. Prevents drying out.

2. Holds food supply for new plant.

3. Protect embryo from injury.

B. 1. Dicot cotyledons store food and protect plumule.

2. Monocot cotyledons protect plumule.

3. Monocot & Dicot plumules contain growth potential for new plant.

4. Monocot & Dicot root tips take in nutrient and water and hold plant in soil.

C. 1. Stores food for plumule.

IV. A. Quality of seed

B. Moisture

C. Temperature

D. Air

E. Seed maturity

F. Light

V. A. Seed absorbs water.

B. Seed coats soften and enlarges.

C. Seed swells causing seed coat to split.

D. Primary root growth out from the split into the soil.

E. Upper portion of plant emerges from soil.

F. Cotyledons open.

G. True leaves unfold.

VI. A. Seed damage

B. Age of seed

C. Wetness of soil

D. Temperature

E. Seed hardness

F. Diseases

G. Planting depth

H. Dormancy

VII. A. Porous

B. Sterile

C. Nutritious

D. Lightweight

VIII. A. Two parts soil-two parts peat-one part sand.

B. Soil and peat mixed equally.

C. Peat moss or vermiculite and fertilizer.

D. Other commercial mixtures.

IX. A. Steam

B. Chemicals

C. Electricity

D. Temperature

X. A. Soil sterility

B. Speed spacing

C. Water

D. Aeration

E. Speed depth

XI. A. Remove cover

B. Place in cool spot

C. Have adequate air and sun

D. Don't over water

XII. A. Water

1. Depends on temperature and sunlight.

B. Temperature

1. Cool weather plant - 50°-55° at night
60°-70° in day

2. Warm weather plants 55°-60° at night
70° in day

3. Keep temperature as constant as possible.

C. Light

1. Excess light causes burned and damaged foliage.

2. Lack of light causes spindling plant.

D. How to prevent disease.
   1. Use proper medium
   2. Use disease free sand
   3. Proper watering
   4. Proper temperature
   5. Proper light
   6. Proper air circulation

XIII. A. Personal preferences
   B. Cost
   C. Strength
   D. Water holding capacity

XIV. A. Transplant when first true leaves appear.
   B. Place new plants in cool shaded place for several days.
   C. Water with fine mist or low pressure so as not to damage plants.
   D. Fertilize

XV. A. Reduce amount of water to each plant.
   B. Reduce the temperature to the outside temperature.
   C. Should take place for about two weeks.

SECTION E

UNIT I

PLANT IDENTIFICATION

PLANT IDENTIFICATION

TERMINAL OBJECTIVE

After completion of this unit, the student will be able to identify 100 plants of the teachers choice. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with plant identification to the correct definition.

II. Identify 5 broad leaved evergreens.

III. Identify 5 flowering shrubs.

IV. Identify 6 small deciduous trees.

V. Identify 5 large deciduous trees.

VI. Identify 7 vines.

VII. Identify 5 coniferous evergreens.

PLANT IDENTIFICATION

SUGGESTED ACTIVITIES

I. Instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss terminal and specific objectives.

   E. Discuss information and assignment sheets.

   F. Give test.

II. Student:

   A. Read objectives.

   B. Study information sheets.

   C. Complete each assignment sheet.

   D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objectives

   B. Information sheets

   C. Assignment sheets

      1. Assignment sheet #1 - Identifying Plants

   D. Answers to assignment sheets

   E. Test

   F. Answers to test

II. References:

   A. Identifying Horticultural Plants, Module No. 2 of Preparing for Entry in Horticulture Service Occupations, Ohio State University.

PLANT IDENTIFICATION

INFORMATION SHEET

I. Terms and definitions:

A. ANNUAL - A plant living one year or less.

B. BIENNIAL - A plant which requires two years to complete its life cycle.

C. PERENNIAL - A plant which normally lives more than two years.

D. HERBACEOUS - Plant with soft-non woody stem.

E. WOODY PLANT - A plant whose above ground stem persist over a winter and is somewhat woody.

F. EVERGREEN - Plant with leaves all year.

G. CONIFER - A cone bearing plant.

H. DECIDUOUS PLANT - Plant that loses its leaves in fall.

II. Identification of broad leaved evergreens.

Appears on the following pages.

BROAD-LEAVED EVERGREENS

No.	Scientific Name and Common Name	Height in feet	Flower Color & Season	Foliage color Normal	Foliage color Fall	Fruit Color & Season	Soil	Sun or Shade	Uses	Remarks
1	Abolia grandiflora (Glossy Abelia	4-10	White to pink June-Oct.	Dark Green	Bronze-Green	--	Normal	Either	Foundation, hedges, mass	One of the best shrubs
2	Aucuba japonica variegata (Goldust Aucuba)	4-12	Purple or white March	Dark green with yellow spots	--	Scarlet (Fall)	Moist	Shade	Specimen, accent foundation, border	Large leavec Fast growing compact plan
3	Aucuba japonica (Japanese Aucuba)	8-12	Purple or white March	Dark green	--	Scarlet (Fall)	Moist	Shade	Specimen, accent foundation, border	"
4	Azalea indica (Indica Azalea)	5-7	Purple to Pink June-July	Dark green Lustrious	--	--	Well-drained acid soil	Sun	Specimen,	Adaptable spreading type
5	Buxus sempervirens (Common Box)	4-6	--	Dark green	--	--	Normal	Some Shade	Hedges, Foundation, entrance, accent	Slow growing compact formal
6	Buxus sempervirens var., suffruiticosa (Dwarf Box)	1-1/2	--	Dark Green	--	--	Normal	Some Shade	Hedges, Foundation, entrance, accent	Very slow gr wing, compact small leaved
7	Camellia japonica (common Camellia)	10-15+	Various Dec-March	Dark Green	--	--	Normal to Acid	Part Shade	Accent, border, specimen	Beautiful flowers, may sun-scald. (Fert & water
8	Elaeagnus pungens reflexa (Bronze Elaeagnus)	6-10+	Bronze-white October	Bronze-green	--	Orange (Winter & Spring)	Normal to alkaline	Either	Foundation (large bldgs.) mass, border	Good foliage & fruit, fragrant flowers
9	Euonymus japonicus (Evergreen Burning-bush)	8-15	--	Dark green	--	Orange (Winter)	Normal	Either	Foundation, hedge	Good for entrance or corners
10	Euonymus patens (Spreading Euonymus)	4-8	Greenish white July	Light green	--	Orange (Winter)	Normal	Either	Edging, border, foundation	Desirable plant
11	Gardenia florida (Cape Jasmine)	6-8	White (June)	Glossy dark green	--	--	Normal to acid	Sun or partial shade	Border, hedge	Attacked by aphids, white fly and scale

BROAD-LEAVED EVERGREENS (continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage Color Normal	Foliage Color Fall	Fruit Color & season	Soil	Sun or shade	Uses	Remarks
12	Hedra helix (English Ivy)	vine	--	Dark green	--	--	Normal	Shade	Foundation, ground cover	Good on stone or brick walls
13	Ilex opaca (American Holly)	25-50	--	Dull green	--	Red (Fall & Winter)	Normal to acid	Either	Accent, border, mass, hedge	Native plant, tree form. Prune heavily when transplanted
14	Ilex vomitoria (Yaupon Holly)	15-25	--	Blue-green	--	Scarlet (Fall, W, Spring)	Moist well-drained	Either	Accent, border, foundation, hedge	Good native plant
15	Jasminum humile (Italian Jasmine)	6-9	Yellow June	Glossy green	--	--	Normal	Sun	Foundation, edging, mass	Arching, spreading, good on banks
16	Jasminum primulinum (Primrose Jasmine)	6-9	Yellow March-April	Light Green	--	--	Normal	Sun	Foundation, edging, mass	" "
17	Laurocerasus caroliniana (Carolina Cherry-laurel)	10-25+	--	Glossy green	--	Black (Fall & Winter)	any	Either	Foundation (large bldgs.), hedge, mass, borders	Adaptable native plant
18	Ligustrum japonicum (Japanese Privet)	15-25	White May	Green to glossy green	--	Purplish (Fall & Winter)	Any	Either	Foundation (large bldgs.), hedge, mass, border	Good plant when properly used
19	Ligustrum lucidum (Glossy Privet)	5-10	White May	Glossy green	--	Black (Winter)	Any	Either	Foundation, hedge mass, border, accent	Very good
20	Ligustrum nepalense (Nepal Privet)	5-7	White May	Glossy green	--	Black (Winter)	Any	Either	Foundation, hedge mass, border, accent	Very good
21	Ligustrum sinense (Chinese Privet)	10-25	White June	Green to Yellow-green	--	Black (Fall & Winter)	Any	Either	Border, hedge, screen	Good, small-leaved privet
22	Ligustrum vulgare (European or Common Privet)	10-25	White June	Dark green	Purplish green	Black (Fall & Winter)	Any	Either	Border, hedge, screen	More erect than Chinese Privet
23	Magnolia grandiflora (Southern Magnolia)	25+	White May	Dark green	--	Red (Fall)	Normal to	Either	Specimen	Coarse textured formal type of native tree

OE - 9 - E

BROAD-LEAVED EVERGREENS (continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color		Fruit Color & season	Soil	Sun or shade	Uses	Remarks
				Normal	Fall					
24	Mahonia aquifolium (Oregon Hollygrape)	4-5	Yellow March-April	Dull green, red tinted	Bronze to purple	Purple-black (Fall)	Normal	Either	Border, mass	Coarse textured plant
25	Mahonia beali (Leatherleaf hollygrape)	6-12	Yellow March-April	Bluish green	--	Bluish-Black (Fall)	Normal well-drained	Either	Borders, mass	Open, coarse textured plant
26	Michelia fuscata (Banana-shrub)	5-10	Brownish-yellow April June	Dark green	--	--	Normal	Sun	Borders: masses	Banana fragrance; good garden shrub
27	Nandina domestica (Nandia)	4-8	White May	Light green	Dark green to red	Red (Fall & Winter)	Normal	Either	Foundation, border, mass	Use in masses and down in front. Good garden shrub
28	Photinia glabra (Smooth Photinia)	5-10+	White Feb.	Dark green-tinged red	Red tinted	--	Normal to acid	Either	Foundation, border, mass	New growth is red
29	Photinia serrulata (Low Photinia)	10-20	White Feb.	Dark green	Red tinted	--	Normal to acid	Either	Foundation, border, mass accent	Coarse, dense plant
30	Pittosporum tobira (Tobira)	5-10	Yellow-white April	Dark green	--	--	Normal	Either	Specimen, foundation, accent	Good dense plant. Not hardy in North Alabama
31	Pyracantha cocinea lalandi (Laland Firethorne)	8-10	White May	Green	--	Orange-red (Fall & Winter)	Normal well-drained	Sun	Border, barrier foundation, specimen	Thorny shrub subject to blight and red spider
32	Pyracantha gibbsi yunnanensis (Yunnan Firethorne)	5-10	White May	Dark green	--	Coral-red (Fall & Winter)	Normal well-drained	Sun	Hedge barrier border, foundation, specimen	Thorny shrub; blights less than Leland Firethorne, usually not attacked by red spider

BROAD-LEAVED EVERGREENS (continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color		Fruit Color & season	Soil	Sun or shade	Uses	Remarks
				Normal	Fall					
33	Raphiolepis indica (Indian-Hawthorn)	5	White to pink May-June	Dark green	--	Bluish-black (F&W)	Normal well-drained	Either	Foundation, border	Similar to Pittosporun tobira
34	Raphiolepis umbellata japonica (Yeddo-hawthorn)	5-10	White May-June	Dark green	--	"	Normal well-drained	Either	Foundation, border	More hardy than Pittosporum tobi
35	Viburnum tinum (Laurustinus)	5-10	White or pinkish-white Feb.	Dark green	--	Purple (Summer & Fall)	Normal	Either	Mass, foundation border	Fragrant flowers

INFORMATION SHEET

III. Identification of flowering shrubs.

ORNAMENTAL FLOWERING SHRUBS

36	Barberis sargentiana (Sargents Barberry)	2-5	Yellow March-April	Green to yellow-green	Scarlet	Red (Fall-winter)	Any	Sun or partial shade	Foundation, hedge, edging, border, barrier	Low, dense, horizontal growth
37	Buddleia lindleyana (Lindley Butterfly-bush)	6-8	Lavender July-Oct.	Brownish-green	Brownish	--	Well-drained	Sun	Border, mass, accent	Showy flowers but ragged plant
38	Callicarpa americana (American Beautyberry)	6-8	Unimportant	Dull green	Yellow	Reddish-purple (Fall)	Well-drained	Shade	Accent, border, mass	Native plant
39	Calycanthus floridus (Common Sweetshrub)	3-6	Brown April	Dark green	Yellow	--	Moist	Shade	Foundation, mass border, accent	Native plant
40	Cephalanthus occidentalis (Common Button-bush)	3-5+	White May-June	Glossy green	Yellow	Gray (Fall-winter)	Moist to wet	Either	Border, mass	Native plant
41	Cornus amomun (Silky Dogwood)	6-9	White May	Light green	Yellow to red	Blue (Fall)	Any	Either	Foundation, mass, border	Good in shady, moist areas
42	Cydonia japonica (Flowering Quince)	6-9	White to Scarlet (March)	Dark green	Yellow to red	Yellow (Fall)	Any	Either	Accent, mass, border	Blooms before leaves appear; excellent to use with Forsythias and Jasmine

ORNAMENTAL FLOWERING SHRUBS (continued)

No.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color		Fruit Color & season	Soil	Sun or shade	Uses	Remarks
				Normal	Fall					
43	Deutzia gracilis (Slender Deutzia)	3-4	White May-June	Dull green	Yellow	--	Any	Either	Border, foundation, edging	Dwarf, dense, plant. Good in flower.
44	Deutzia lemoinei (Lemoine Deutzia)	3-4	White May-June	Dull green	Yellow	--	Any	Sun	Border, foundation, edging	Upright, dwarf plant
45	Deutzia scabra (Fuzzy Deutzia)	6-9	White, pink tinted May	Dull green	Yellow	--	Any	Sun	Border, foundation, mass, accent	Good, early flowering plant
46	Exochorda grandiflora (Pearlbush)	10-20	White April	Bluish-green	Yellow	--	Normal	Sun or partial shade	Border, mass, accent	Good flowers and foliage
47	Forsythia intermedia (Border Forsythia)	6-9	Yellow March	Bright	Purplish	--	Normal	Either	Border, mass, foundation	Especially good in mass plantings
48	Forsythia suspensa (Weeping Forsythia)	6-9	Yellow March	Bright green	Purplish	--	Normal	Either	Border, mass, foundation	May be trained as a vine. Good over walls or banks
49	Forsythia viridissima (Greenstem Forsythia)	6-9	Yellow March	Bright green	Purplish	--	Normal	Either	Border, mass, accent, foundation	Good for mass plantings
50	Hibiscus syriacus (Shrub-althea, also called Rose-of-Sharon)	6-10+	Various June-Oct.	Green	Yellow	Dry Pod	Normal	Sun	Border, mass, hedge, accent	Good for flowers and unclipped hedges.
51	Hydrangea quercifolia (Oakleaf Hydrangea)	3-4	White May-June	Dull green	Yellow and	Ragged flower head	Any	Either	Mass, border accent	Coarse textured native plant. Good in dense shade
52	Jasminum nudiflorum (Winter Jasmine)	3-4+	Yellow Jan.-Feb.	Dark green	Yellow green		Normal	Sun	Foundation, edging, mass	Good on banks and for early yellow flower.
53	Kerria japonica (Kerria or Globe-flower)	4- 7	Yellow May-August	Light green	Yellow		Well-drained	Partial shade	Mass, edging border	Spreading. Good for flower and foliage

ORNAMENTAL FLOWERING SHRUBS (continued)

No.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color		Fruit Color & season	Soil	Sun or shade	Uses	Remarks
				Normal	Fall					
54	Lonicera fragrantissima (Winter Honeysuckle)	5-7	Creamy white Jan.	Light green	Yellow and	Red (Spring & Summer)	Normal	Either	Foundation, mass, border	Adaptable plant
55	Lonicera morrowi (Morrow Honeysuckle)	5-7	White March-April	Dark green	Yellow	Red (Spring)	Normal	Either	Foundation, mass, border	Vigorous, spreading plant
56	Philadelphus coronarius (Sweet Mockorange)	6-10+	White April-May	Dull green	Yellow	Ragged clusters	Well-drained	Sun	Border, mass, screen,	Fragrant flowers coarse textured
57	Rhus glabra (Smooth Sumac)	10-15	Green (Spring)	Green	Yellow to red	Red Summer	Any	Either	Border, mass, accent	Good fall color native, very coarse textured
58	Spiraea anthony waterer (Anthony Waterer Spirea)	2-3	Rose to Crimson June-Fall	Dull green	Red & yellow	--	Normal	Sun	Mass, edging, foundation	Good for summer bloom
59	Spiraea prunifolia (Bridalwreath Spirea)	4-6	White March	Dull green	Glossy red & yellow	--	Normal	Sun	Foundation, border, mass	Good, early flowering plant Best in background
60	Spiraea reevesiana (Reeves Spirea)	4-5	White (April)	Dull green	Dull red & yellow	--	Normal	Sun	Foundation, border, mass	One of the best spireas in bloom
61	Spiraea thunbergi (Thunberg Spirea)	2-4	White March	Yellow-green	Clearest yellow	--	Normal	Either	Foundation, edging, border	Fine textured plant
62	Spiraea vanhouttei (Vanhoutte Spirea)	4-6	White April	Dull green	Dull red & yellow	--	Normal	Sun	Foundation, border, mass	Very popular. Good in flower.
63	Viburnum carlesi (Fragrant Viburnum)	3-5	White March	Gray green	Red	Blue-black (Fall)	Any	Sun	Foundation, mass, accent border	Good in flower
64	Weigela candida (Snow Weigela)	6-10	White (May)	Green	Red tinted	--	Normal	Sun	Accent, mass, border	Good in flower
65	Weigela eva rathke (Scarlet Weigela)	6-10	Reddish Purple May-Aug.	Green	Red	--	Normal	Sun	Accent, border, foundation, mass	Free blooming variety

PLANT IDENTIFICATION

INFORMATION SHEET

IV. Identification of small deciduous trees.

SMALL DECIDUOUS TREES

67	Albizzia julibrissin (Silktree or Mimosa)	15-25+	Pink (Spring & Summer)	Blue-green	--	Brown pod (Fall)	Any	Sun	Specimen, border, screen shade	Blooms all summer, foliage remains until late fall
68	Cercis canadensis (Redbud)	15+25	Rosy-purple (April)	Light green	Yellow	Brown pod (Fall)	Moist, well-drained	Either	Border, mass, accent	Good native plant
69	Chinoanthus virginica (White Fringetree)	15+	White May-June	Bright green	Yellow	--	Moist, well-drained	Sun or partial shade	Border, mass, specimen	Good in flower; native plant
70	Cornus florida (White Dogwood)	15+30	White March-April	Green	Red, yellow	Red (Fall & Winter)	Well-drained	Either	Specimen, accent, border	One of the best native plants
71	Lagerstroemia indica (Common Crapemyrtle)	10-25	Various June-Oct.	Dark green	Red & yellow	--	Any	Sun	Specimen, mass, accent, border	Good in flower Not a street tree
72	Magnolia soulangeana (Saucer Magnolia)	15+	White, purple tinted (March)	Dark green	--	--	Moist, well drained	Sun or partial shade	Specimen, accent, border	Coarse textured plant. Large flower

PLANT IDENTIFICATION

INFORMATION SHEET

V. **Identifying large deciduous trees.**

LARGE DECIDUOUS TREES

73	Acer dasycarpum (Silver Maple)	75+	--	Light green	Yellow	--	Moist	Sun	Shade, border framing	Light shade. Subject to scale and short lived
74	Acer rubrum (Red Maple)	75+	Red Feb.	Light green	Red, orange & yellow	Red (Early Spring)	Moist	Sun	Shade, border	Good foliage color
75	Acer saccharum (Sugar Maple)	75+	--	Light green	Yellow & scarlet	--	Any	Sun	Shade, border, framing, street tree	Better for use in N. Alabama and North

LARGE DECIDUOUS TREES (continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color Normal	Foliage color Fall	Fruit Color & season	Soil	Sun or shade	Uses	Remarks
76	Carya pecan (Pecan)	75+	--	Light green	Brown	Brown nut (Fall)	Rich moist	Sun	Shade, screen, background	Leaves fall earl Use to side and rear of property
77	Liquidambar styraciflua (Sweetgum)	60-140	--	Dark green	Crimson yellow	Brown (Summer, Fall & Winter)	Moist	Either	Border, screen background	Good for fall color. Fruit objectionable
78	Populus nigra-italica (Lombardy Poplar)	25-40	--	Light green	Yellow	--	Any	Sun partial shade	Background, screen accent	Suckers badly Leaves fall earl short lived
79	Quercus nigra (Water Oak)	80	Red March	Dull blue-green	Yellow	Light brown acorn (Summer Fall)	Moist (any)	Sun	Shade, framing background, specimen street tree	Practically evergreen. Fast growing
80	Quercus virginiana (Live Oak)	50	--	Glossy green	Ever-green	Dark brown acorn (Sunner & Fall)	Moist	Sun	Shade, specimen, street or roadside	Spreading, long-lived, slow-growing
81	Salix babylonica (Weeping Willow)	30-40	--	Yellow-green	Yellow	--	Any	Sun or partial shade	Border, accent specimen (If carefully uded	Often associated with water-side developments
82	Ulmus alata (Winged Elm)	50+	--	Green	Yellow	--	Any	Sun	Border, framing, background, shade, street tree, specimen	A desirable tree
83	Ulmus americana (American Elm)	50-75+	--	Green	Yellow	--	Rich, moist (any)	Sun	"	Subject to attack by insects and diseases.
84	Ulmus pumila (Chinese Elm)	25+40	--	Green	Yellow	--	Rich, moist (any)	Sun	Border, shade, framing	Fast growing, graceful, small tree

PLANT IDENTIFICATION

INFORMATION SHEET

VI. Identification of vines.

VINES

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color Normal	Foliage color Fall	Fruit Color & season	Soil	Sun or shade	Uses	Remarks
85	Ampelopsis tricuspidata (Japanese Creeper or Boston Ivy)		--	Glossy green	Yellow and crimson	Blue	Any	Either	Foundation, stone, and brick walls	A good hardy climber
86	Bignonia grandiflora (Chinese Trumpet Creeper)		Deep orange June-Oct.	Dark green	Yellow	--	Any	Either	Accent, mass foundation, (supported on frame or tree	Good in flower (Not native)
87	Clematis paniculata (Sweet Autumn Clematis)		White Aug-Oct.	Light green	Purple tinted	White (Fall)	Any	Sun	Foundation, accent, mass (needs support)	A good fall flowering vine
88	Gelsemium sempervirens (Carolina-jessamine		Yellow Feb-April	Shiny green	Evergreen	--	Any	Either	Accent, mass, screen (needs support)	Native plant slightly poisonous when taken internally
89	Smilax lanceolata (Florida Smilax)		--	Dark green	Evergreen	Black (Winter)	Any	Either	Mass, screen (needs support	Native vine. Good for winter decoration
90	Wisteria chinensis (Chinese Wisteria)		White or Purple Aprl-May	Dull green	Brown	Brown bean	Any	Sun or partial shade	Accent, mass, screen	Good in flower
91	Wisteria frutescens (American Wisteria)		Bluish-purple Apr.-May	Dull green	Brown	"	Any	"	"	Native plant

PLANT IDENTIFICATION

INFORMATION SHEET

VII. Identifying Coniferous Evergreens

CONIFEROUS EVERGREENS
(Trees and Shrubs)

92	Chamaecyparis obtusa nana (Dwarf Hinoki Cypress)	3-5	--	Dark green	--	--	Moist, well-drained	Sun, partial shade	Foundation, accent	Good, foliage, and form
93	Chamaecyparis pisifera (Sawara Cypress)	10-15+	--	Bright green	--	--	Normal	"	Accent, specimen screen	Open, tall growing plant
94	Chamaecyparis pisifera filifera (Moss Retinospera)	6-10+	--	Dull green	--	--	"	"	Foundation, (must be pruned)accent, specimen, border	Loose, open, drooping form

CONIFEROUS EVERGREENS
(Trees and Shrubs continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage color Normal	Fall	Fruit Color & season	Soil	Sun or shade	Uses	Remarks
95	Chamaecyparis pisifera plumosa (Plume Retinospera)	6-10+	--	Gray-green	--	--	"	"	"	Attractive foliage
96	Juniperus chinensis pfitzeriana (Pfitzer Juniper)	3-4	--	Gray-green	--	--	"	"	Foundation, edging, mass	One of the best spreading conifers
97	Juniperus communis kiyonoi (Kiyono Juniper)	10-15+	--	Blue-green	--	--	Moist, well-drained	Sun	Foundation, accent, border mass	A good pyramidal form
98	Juniperus horizontalis (Creeping Juniper)	1-2	--	Green	--	--	Normal	Sun or partial shade	Edging, foundation ground cover	A good ground-cover type
99	Juniperus horizontalis douglasi (Waukegan Juniper)	1-2	--	Silvery, blue-green	Purple tinted	--	Normal	Sun & partial shade	Edging, foundation ground cover	A compact, spreading type
100	Juniperus virginiana (Red Cedar)	25+	--	Dark green	--	Blue, (Fall & Winter)	Dry	Sun	Mass, border, hedge, screen	An adaptable native plant
101	Pinus caribaea (Slash Pine)	75	--	Dark green	--	Brown cone (Fall & Winter)	Moist	Sun	Shade, framing background, screen, specimen	Fast growing attractive tree
102	Pinus palustris (Longleaf Pine)	75	--	Dark green	--	"	Well-drained	Sun	"	Gives good effect Hard to transplant
103	Pinus taeda (Loblolly Pine)	75	--	Blue-green	--	"	Wet or moist	Sun	"	Not as attractive as slash and longleaf
104	Thuja occidentalis (American Arbrvitae)	10-25	--	Light green	--	--	Moist	Sun	Foundation, accent, border	Better than oriental forms for general use
105	Thuja occidentalis globosa (American Arborvitae)	3-5	--	Light green	--	--	Moist	Sun	Foundation, accent, edging (For tall planting)	Low, spreading, cpmpact plant

OH - 21-E

CONIFEROUS EVERGREENS (continued)

NO.	Scientific Name and Common Name	Height in feet	Flower Color & season	Foliage Color		Fruit Color & season	Soil	Sun or shade	Uses	Remarks
				Normal	Fall					
106	Thuja occidentalis pyramidalis (American Pyramidal Arborvitae)	6-10+	--	Dark green	--	--	Moist	Sun	Accent, border foundation	A compact,erect, columnar formed plant
107	Thuja orientalis texana glauca (Texas Blue Arborvitae)	10-15	--	Blue-green	Purple tinted	--	Moist	"	Accent,border specimen	Good foliage (Use with care)
108	Thuja orientalis nana compacta (Compact Oriental Arborvitae)	6-12	--	Light green	--	--	Moist	Sun	Foundation, border,accent	Good compact plant

PLANT IDENTIFICATION

ASSIGNMENT SHEET #1 - IDENTIFYING PLANTS

A. Have student locate and identify 100 plants, shrubs and trees.

PLANT IDENTIFICATION

ANSWERS TO ASSIGNMENT SHEET

Assignment sheet #1

To the satisfaction of the instructor.

PLANT IDENTIFICATION

TEST

I. Match the terms below to the correct definition.

___A. Deciduous Plant

___B. Annual

___C. Biennial

___D. Evergreen

___E. Conifer

___F. Woody Plant

___G. Perennial

___H. Herbaceous

1. A plant living one year or less.
2. A plant which required two years to complete its life cycle.
3. A plant which normally lives more than two years.
4. Plant with soft-non woody stem.
5. A plant whose above ground stem persist over a winter and is some what woody.
6. Plant with leaves all year.
7. A cone bearing plant.
8. Plant that loses its leaves in fall.

II. Identify 5 broad leaved evergreens.

A.

B.

C.

D.

E.

III. Identify 5 flowering shrubs.

A.

B.

C.

D.

E.

IV. Identify 6 small deciduous trees.

A. D.

B. E.

C. F.

V. Identify 5 large deciduous trees.

A.

B.

C.

D.

E.

VI. Identify 7 vines.

A.

B.

C.

D.

E.

F.

G.

VII. Identify 5 coniferous evergreens.

A.

B.

C.

D.

E.

PLANT IDENTIFICATION

ANSWERS TO TEST

I. A. 8
   B. 1
   C. 2
   D. 6
   E. 7
   F. 5
   G. 3
   H. 4

II. To the satisfaction of the instructor.

III. To the satisfaction of the instructor.

IV. A. Albizziz julibrissin (Silktree or Mimisa)
   B. Cercis canadensis (Redbud)
   C. Chinoanthus verginica (White Fringetree)
   D. Cornus florida (White Dogwood)
   E. Lagerstroemia indica (Common Crapemyrtle)
   F. Magnolia soulangeana (Saucer Magnolia)

V. To the satisfaction of the instructor.

VI. A. Ampleopsis tricuspidata (Japanese Creeper or Boston Ivy)
   B. Bignonia grandiflora (Chinese Trumpet Creeper)
   C. Clematis paniculata (Sweet Autumn Clematis)
   D. Gelsemium sempervirens (Carolina jessamine)
   E. Smilax lanceolata (Florida Smilax)
   F. Wisteria chinensis (Chinese Wisteria)
   G. Wisteria frutescens (American Wisteria)

VII. To the satisfaction of the instructor.

SECTION F

UNIT I

CARE OF ORNAMENTAL PLANTS

CARE OF ORNAMENTAL PLANTS

TERMINAL OBJECTIVES

After completion of this unit, the student will be able to care for plants as well as proper watering, pruning and fertilizing. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Know why new bought plants die when taken home.

II. List five facts about temperature control.

III. List four facts about humidity control.

IV. List three facts about light control.

V. List four facts about fertilizing houseplants.

VI. Know how to water properly.

VII. List three facts about pruning.

VIII. Diagnose houseplant problems.

CARE OF ORNAMENTAL PLANTS

SUGGESTED ACTIVITIES

I. Instructor:

  A. Provide student with objective sheet.

  B. Provide student with information and assignment sheet.

  C. Make transparencies.

  D. Discuss terminal and specific objectives.

  E. Discuss information and assignment sheets.

  F. Give test.

II. Student:

  A. Read objectives.

  B. Study information sheets.

  C. Complete each assignment sheet.

  D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

  A. Objectives

  B. Information sheets

  C. Assignment sheet

    1. Assignment sheet #1 - Diagnosis of Plant Problems

  D. Answers to assignment sheets

  E. Test

  F. Answers to test

II. References:

A. Care Of House Plants, Cooperative Extension Service, University of Arkansas, Division of Ag and U.S. Department of Ag Cooperating, Leaflet 247.

CARE OF ORNAMENTAL PLANTS

INFORMATION SHEET

I. Why new bought plants die when taken home.

- A. Due to the plants inability to adapt to a new environment.
- B. Changes in:
  1. Humidity
  2. Light
  3. Water
- C. If plant is preconditioned or held in stock for two-three weeks in your local store it should be safe.

II. Temperature controls for house plants.

- A. Thrive best in cool room.
- B. Keep temperature between 55° and 70° F.
- C. Few plants thrive in a dry atmosphere above 75°.
- D. Keep plant out of overheated rooms in winter.
- E. In summer keep them in the coolest spots available.

III. Humidity control for houseplants.

- A. Relative humidity of 75 to 85% is considered ideal.
- B. Proper humidity control can be obtained by using:
  1. Humidifiers
  2. Evaporating pans
  3. Growing plants in shallow metal pans with moist sand.
- C. Humidity is usually high in backrooms and kitchens.
- D. Humidity can be increased by growing plants together and misting plants several times a day.

INFORMATION SHEET

IV. Proper light control for houseplants.

   A. Insufficient light is a major drawback to houseplants.

      1. If enough light for reading there is enough light for plants.

   B. Morning sun is preferred over evening sun.

   C. If evening sun is only available, sun screens should be used.

V. Fertilizing houseplants properly.

   A. Active plants should be fed 1-2 times a month with a balanced fertilizer.

   B. Over fertilization will result in burning of the leaves.

   C. Use organic fertilizers on plants grown in containers without drainage.

      1. These plants should be fed less often with lower rates than pots with drainage.

   D. Decrease fertilization in the winter months.

VI. Watering houseplants.

   A. Over watering is the major cause of plant damage.

      1. Roots may suffocate and rot.

   B. Frequency of watering depends on:

      1. Type of plant

      2. Location

      3. Rate of growth

      4. Type of soil

      5. Size of pot

   C. Soil should be allowed to dry between watering but plant should not wilt.

INFORMATION SHEET

D. Less water is needed in winter due to less active growth of the plant.

VII. Facts concerning pruning houseplants.

A. Pruning fast growing plants encourage branching and fullness.

B. Old ragged leaves should be removed.

C. Should prune large plants after inactive growth periods.

VIII. Diagnosis of houseplant problems.

A. Leaf edges crip and brown. New growth may quickly wither.

1. Cause - Too much heat, too low humidity, uneven soil mixture, excessive salts in the soil.

2. Remedy - Move plant to cooler location, increase humidity about plant by use of tray of stones. Water soil thoroughly and more often. Use containers with adequate drainage. Do not allow drainage water to be reabsorbed. If container has no drainage, repot frequently.

B. Lower leaves yellow.

1. Cause - Improper growing condition, age of particular leaf, nitrogen deficiency or too little light.

2. Remedy - Avoid extreme temperatures. Check watering and fertilization practices. Soil may be tested. Old leaves will mature and may turn yellow. They should be clipped off the plant.

C. Leaves appear lifeless, limp and the plant wilts frequently.

1. Cause - Poor root activity due to improper watering (usually too much), too much fertilizer, excessive soluble salts or disease.

2. Remedy - Use an appropriately sized container. Pot in a well drained soil mix. Fertilize lightly on a regular program rather than a large amount once in a while.

INFORMATION SHEET

D. New foliage is yellow.

  1. Cause - Ph of soil may be incorrect, inadequate light, poor root activity.

  2. Remedy - Water plants with chelated iron according to directions on package at two week intervals until growth becomes normal. Problem is common on azaleas, camellias and gardenias (in these plants the veins will appear darker green than the rest of the leaf).

E. Yellowish or whitish rings on foliage of African Violets, etc.

  1. Cause - Cold water on leaves.

  2. Remedy - Always use lukewarm water. Water early in the day. Don't let sun hit foliage with water on it. Some tropical plants watered with ice cold water show these symptoms very quickly.

F. Plant produces no flowers.

  1. Cause - Not enough sun, improper daylength, too much water and fertilizer.

  2. Remedy - Adjust light to individual plant needs, (plants such as poinsetta, chrysanthemum, etc., require a specific daylength), increase humidity, fertilize with balanced fertilizer suggested for houseplants.

G. Flower buds and/or leaves fall off.

  1. Cause - Poor growing conditions. When plant is brought into the home, it may have difficulty adjusting to conditions in the home.

  2. Remedy - Avoid rapid fluctuations in temperature, improve humidity about plant, moisten sensative plants twice daily or place in a plastic bag and remove gradually as the plant becomes acclimated.

H. Stems gradually turn to mushy brown or black, leaves wilt.

  1. Cause - Disease.

  2. Remedy - Do not water too much, keep plants dry, ventilate, check soil for drainage, discard diseased plants. Problem common on african violets, gloxinias, geraniums and others.

INFORMATION SHEET

I. Insect damage.

1. Cause - Spider mites, aphids, white fly, mealy bugs, scale and many others.
2. Remedy - Use appropriate pesticides. Mites, etc. often can be washed off-repeat frequently for control.

CARE OF ORNAMENTAL PLANTS

ASSIGNMENT SHEET #1 - DIAGNOSIS OF PLANT PROBLEMS

A. Have the student secure an unhealthy plant and diagnose the problem.

PLANT	PROBLEM	CURE

CARE OF ORNAMENTAL PLANTS

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

CARE OF ORNAMENTAL PLANTS

TEST

I. Why may new bought plants die when taken home?

II. List five facts about temperature control for house plants.

A.

B.

C.

D.

E.

III. List four facts about humidity control.

A.

B.

C.

D.

IV. List three facts about light control.

A.

B.

C.

V. List four facts about fertilizing house plants.

A.

B.

C.

D.

VI. Frequency of watering houseplants depends on.

A.

B.

C.

D.

E.

VII. List three facts about pruning.

A.

B.

C.

VIII. Diagnose the following plant problems.

A. New foliage is yellow.

1. Cause

2. Remedy

B. Plant produces no flowers.

1. Cause

2. Remedy

CARE OF ORNAMENTAL PLANTS

ANSWERS TO TEST

I. Should contain the following information:

  A. Due to the plants inability to adapt to a new environment.

  B. Changes in:

    1. Humidity

    2. Light

    3. Water

II. A. Thrive best in a cool room.

  B. Keep temperature between 55° and 70o F.

  C. Few plants thrive in a dry atmosphere above 75° F.

  D. Keep plants out of overheated room in winter.

  E. In summer keep them in the coolest spots available.

III. A. Relative humidity of 75 to 85% is considered ideal.

  B. Proper humidity can be obtained by using:

    1. Humidifiers

    2. Evaporating pans

    3. Growing plants in shallow metal pans with moist sand.

  C. Humidity is usually high in backrooms and kitchens.

  D. Humidity can be increased by growing plants together andmisting plants several times a day.

IV. A. Insufficient light is a major drawback to house plants.

  B. Morning sun is preferred over evening sun.

  C. If evening sun is only available, sun screens should be used.

V. A. Active plants should be fed 1-2 times a month with a balanced fertilizer.

B. Over fertilization will result in burning of the leaves.

C. Use organic fertilizers on plants grown in containers without drainage.

D. Decrease fertilization in the winter months.

VI. A. Type of plant

B. Location

C. Rate of growth

D. Type of soil

E. Size of pot

VII. A. Pruning fast growing plants encourages branching and fullness.

B. Old ragged leaves should be removed.

C. Should prune large plants after inactive growth period.

VIII. A. 1. Cause - Ph of soil may be incorrect, inadequate light, poor root activity.

2. Remedy - Water plants with chelated iron according to directions on package at two week intervals until growth becomes normal. Problem is common on azaleas, camellias and gardenias (in these plants the veins will appear darker green than the rest of the leaf).

B. 1. Cause - Not enough sun, improper daylength, too much water and fertilizer.

2. Remedy - Adjust light to individual plant needs, (plants such as poinsetta, chrysanthemum, etc., require a specific daylength), increase humidity, fertilize with balanced fertilizer suggested for houseplants.

SECTION G

UNIT I

PROPAGATION STRUCTURES

PROPAGATING STRUCTURES

TERMINAL OBJECTIVE

After completion of this unit, the student should be able to identify the various propagating structures and be able to choose the type best suited for their need. This knowledge will be evidenced by scoring at least eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

I. Match terms associated with propagating structures to the correct definition.

II. List seven types of growing structures.

III. Discuss cold frames.

IV. List two facts about hot beds.

V. List three facts about hot caps.

VI. List two facts about lathhouse.

VII. List two facts about clothhouse.

VIII. List three facts about sash greenhouse.

IX. Discuss greenhouse.

X. List facts to consider before building a greenhouse.

XI. List three greenhouse shapes.

PROPAGATING STRUCTURES

SUGGESTED ACTIVITIES

I. Instructor:

   A. Provide student with objective sheet.

   B. Provide student with information and assignment sheets.

   C. Make transparencies.

   D. Discuss terminal and specific objectives.

   E. Discuss information and assignment sheets.

   F. Give test.

II. Student:

   A. Read objectives.

   B. Study information sheets.

   C. Complete each assignment sheet.

   D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

   A. Objectives

   B. Information sheets

   C. Transparency masters

      1. TM 1 - Lean To Structure

      2. TM 2 - Detached

      3. TM 3 - Ridge and Furrow

   D. Assignment sheet

      1. Assignment sheet #1 - Greenhouse Identification

   E. Answers to assignment sheet

F. Test

G. Answers to test

II. References:

A. Hartman and Kester, Plant Propagation, New Jersey, Prentice Hall, Inc. 1975.

B. R. Sheldrake, Jr. Planning, Constructing and Operating Plastic Covered Greenhouses.

PROPAGATING STRUCTURES

INFORMATION SHEET

I. Terms and definitions:

   A. COLD FRAME - Unheated frame building that uses the suns rays to supply heat.

   B. HOT BED - Similar to cold frame except heat is applied to the plant growing media.

   C. HOT CAPS - Covers put on plants when there is danger of frost.

II. Types of plant growing structures.

   A. Cold frame

   B. Hot bed

   C. Hot caps

   D. Lathhouse

   E. Clothhouse

   F. Sash greenhouse

   G. Greenhouse

III. Cold frames

   A. Can be used all year.

   B. Should be located on well drained soil.

   C. Should be near the greenhouse.

   D. Should be protected from the north.

   E. Can be built of wood or concrete.

      1. If made of wood-the wood should not be treated with a substance harmful to the young plants.

   F. Back should be 6" higher than front.

   G. Top can be built of glass, plastic, fiberglass, etc.

   H. Supply adequate ventilation.

   I. Shade may be necessary in summer months.

INFORMATION SHEET

IV. Hot beds:

- A. Uses manure, electricity or fuel to supply heat.
- B. Can be used the same as a cold frame without the fear of freezing damage.

V. Hot caps:

- A. Used on plants planted early while there is danger of frost.
- B. Coverings consist of baskets, cans and jars.
- C. Enables plants to be started earlier in the season.

VI. Lathhouse:

- A. Protect plants from sun.
- B. Easy and inexpensive to build.

VII. Clothhouse:

- A. Used for outdoor plants which must be protected from insects.
- B. Acts as a barrier to insects which could carry disease.

VIII. Sash greenhouse:

- A. A cross between a lathed and a greenhouse.
- B. Is a double hot bed which permits a person to stand upright.
- C. Any heating system used for a greenhouse can be adapted for this structure.

IX. Greenhouse:

- A. Constructed of:
    - 1. Glass
    - 2. Fiberglass
    - 3. Plastic
- B. Cooled by use of:
    - 1. Fans

INFORMATION SHEET

2. High pressure fogs

C. Ventilation is usually by:

1. Side sashes
2. Roof ventilation

D. Additional equipment to be added to the greenhouse:

1. Carbon dioxide generators
2. Fertilizer injection equipment
3. Automatic watering system
4. Mist systems
5. Humidity indicators

E. Houses are heated by:

1. Steam
2. Hot water
3. Forced air

F. Glass greenhouse:

1. Expensive
2. Frame is constructed of wood, pipe, iron and aluminum
3. Use double strength glass to guard against weather damage

G. Plastic greenhouse:

1. Inexpensive
2. Usually are temporary structures
3. Builds up a high humidity
4. In the winter water drips may occur due to condensation

H. Fiberglass greenhouse:

1. Use only clear panels
2. Is more expensive than plastic

INFORMATION SHEET

3. Panels will darken with age reducing light transmission

X. Facts to consider before building a greenhouse.

  A. Site to be built on

  B. Size

  C. When it will be used

  D. Type of materials to use

  E. Shape

  F. Heating and cooling

  G. Plants to be grown

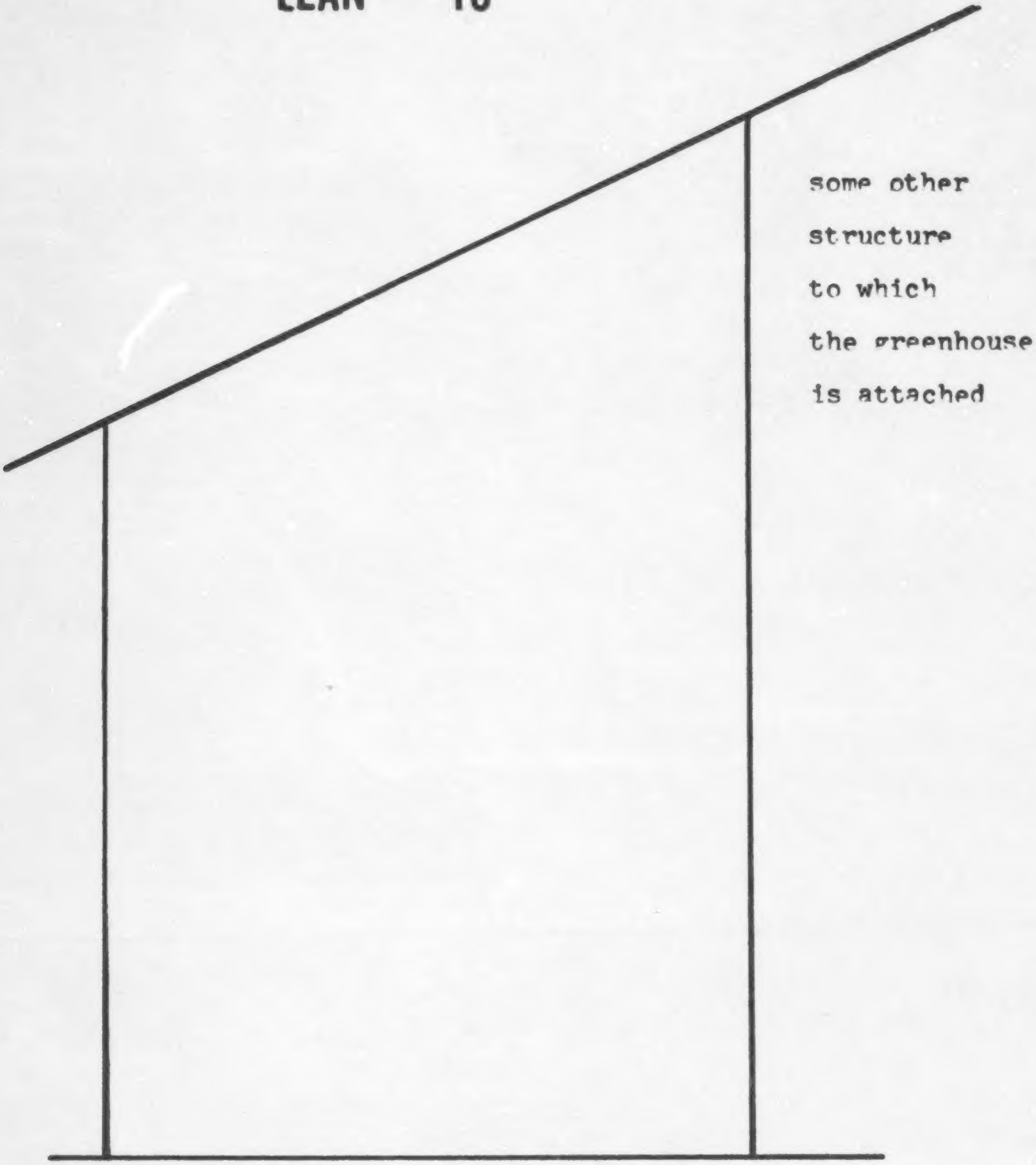
XI. Greenhouse shapes:

  A. Lean to

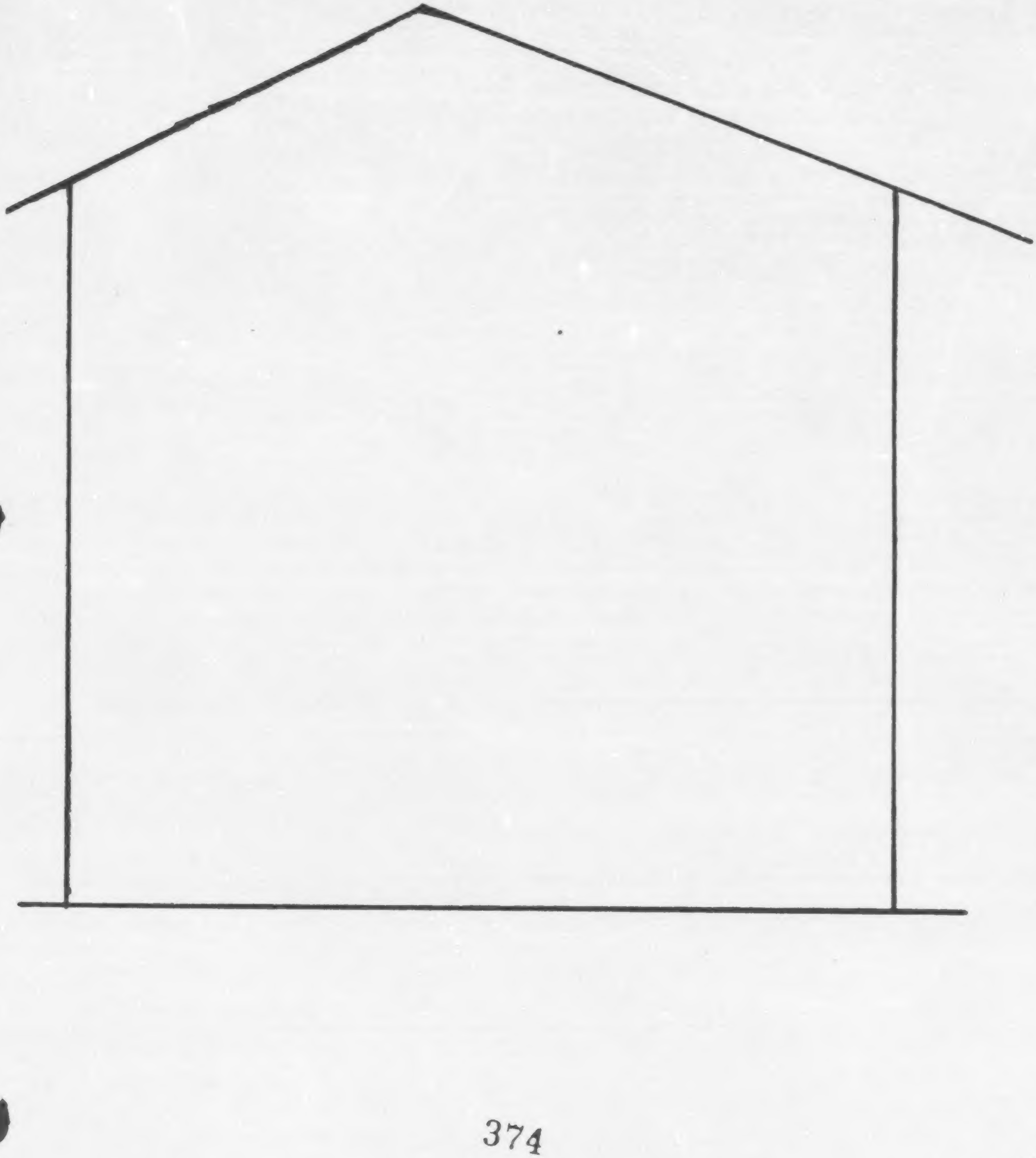
  B. Detached

  C. Ridge and furrow

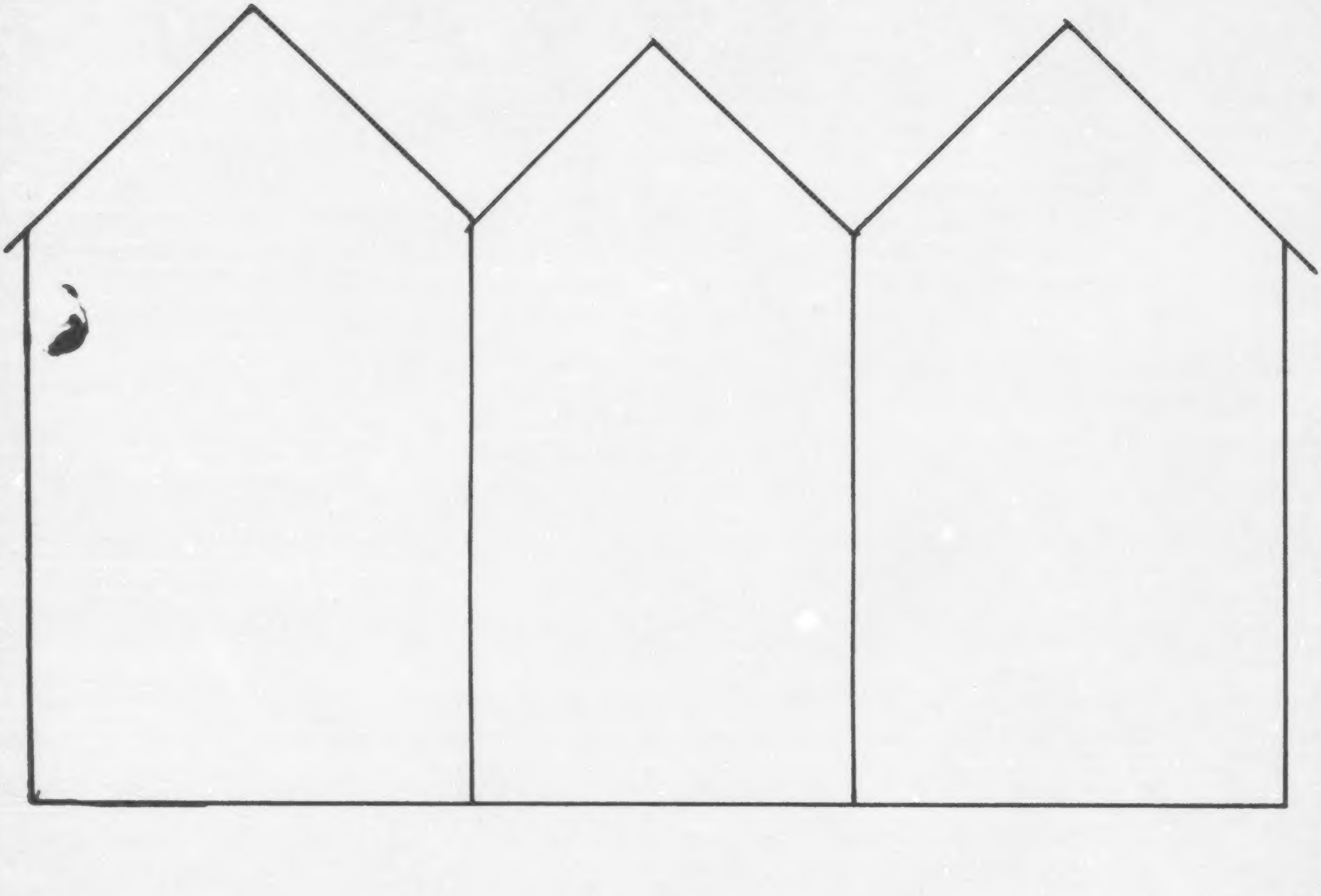
LEAN TO


some other
structure
to which
the greenhouse
is attached

DETACHED



OH - 13-G



TM 3

PROPAGATING STRUCTURES

ASSIGNMENT SHEET #1 - GREENHOUSE IDENTIFICATION

A. Have the student visit local greenhouse and identify which type they are.

NAME	STRUCTURE TYPE
1.	
2.	
3.	

PROPAGATING STRUCTURES

ANSWERS TO ASSIGNMENT SHEETS

Assignment sheet #1

To the satisfaction of the instructor.

PROPAGATING STRUCTURES

TEST

I. Match the terms listed below to the correct definition.

___A. Hot Caps	1.	Unheated frame building that uses the suns rays to supply heat.
___B. Cold Frame		
___C. Hot Bed	2.	Similar to cold frame except heat is applied to the plant growing media.

3. Covers put on plants when there is danger of frost.

II. List seven types of plant growing structures.

A.

B.

C.

D.

E.

F.

G.

III. Discuss in a short paragraph, cold frames.

IV. List two facts about hot beds.

A.

B.

V. List three facts about hot caps.

A.

B.

C.

VI. List two facts about lathhouse.

A.

B.

VII. List two facts about clothhouse.

A.

B.

VIII. List three facts about sash greenhouse.

A.

B.

C.

IX. Discuss in a short paragraph, greenhouses.

X. List seven facts to consider before building a greenhouse.

A.

B.

C.

D.

E.

F.

G.

XI. List three greenhouse shapes.

A.

B.

C.

PROPAGATING STRUCTURES

ANSWERS TO TEST

I. A. 3

B. 1

C. 2

II. A. Cold frame

B. Hot bed

C. Hot caps

D. Lathhouse

E. Clothhouse

F. Sash greenhouse

G. Greenhouse

III. Should contain the following information.

A. Can be used all year.

B. Should be located on well drained soil.

C. Should be near the greenhouse.

D. Should be protected from the north.

E. Can be built of wood or concrete.

F. Back should be 6" higher than front.

G. Top can be built of glass, plastic, fiberglass, etc.

H. Supply adequate ventilation.

I. Shade may be necessary in summer months.

IV. A. Uses manure, electricity or fuel to supply heat.

B. Can be used the same as a cold frame without the fear of freezing damage.

V. A. Used on plants planted early while there is danger of frost.

B. Coverings consist of baskets, cans and jars.

C. Enables plants to be started earlier in the season.

VI. A. Protect plants from sun.

B. Easy and inexpensive to build.

VII. A. Used for outdoor plants which must be protected from insects.

B. Easy and inexpensive to build.

VIII. A. A cross between a lathed and a greenhouse.

B. Is a double hot bed which permits a person to stand upright.

C. Any heating system used for a greenhouse can be adapted for the structure.

IX. Should contain the following information:

A. Greenhouses are constructed of:

1. Glass
2. Fiberglass
3. Plastic

B. Cooled by:

1. Fans
2. High pressure fogs

C. Ventilated by:

1. Side sashes
2. Roof ventilation

D. Additional equipment to be added to greenhouse:

1. Carbon dioxide generators
2. Fertilizer injection equipment
3. Automatic watering systems

4. Mist systems

5. Humidity indicators

E. Heated by:

1. Steam

2. Hot water

3. Forced air

F. Three facts about glass greenhouses:

1. Expensive

2. Frame is constructed of wood, pipe, iron and aluminum.

3. Use double strength glass to guard against weather damage.

G. Plastic greenhouse:

1. Inexpensive

2. Usually are temporary structures.

3. Builds up a high humidity.

4. In the winter water drips may occur due to condensation.

H. Fiberglass greenhouses:

1. Use only clear panels.

2. Is more expensive than plastic.

3. Panels will darken with age reducing light transmission.

X. A. Site to be built on.

B. Size

C. When it will be used.

D. Type of materials to use.

E. Shape

F. Heating and cooling

G. Plants to be grown.

XI. A. Lean to

B. Detached

C. Ridge and furrow

"END OF DOCUMENT"